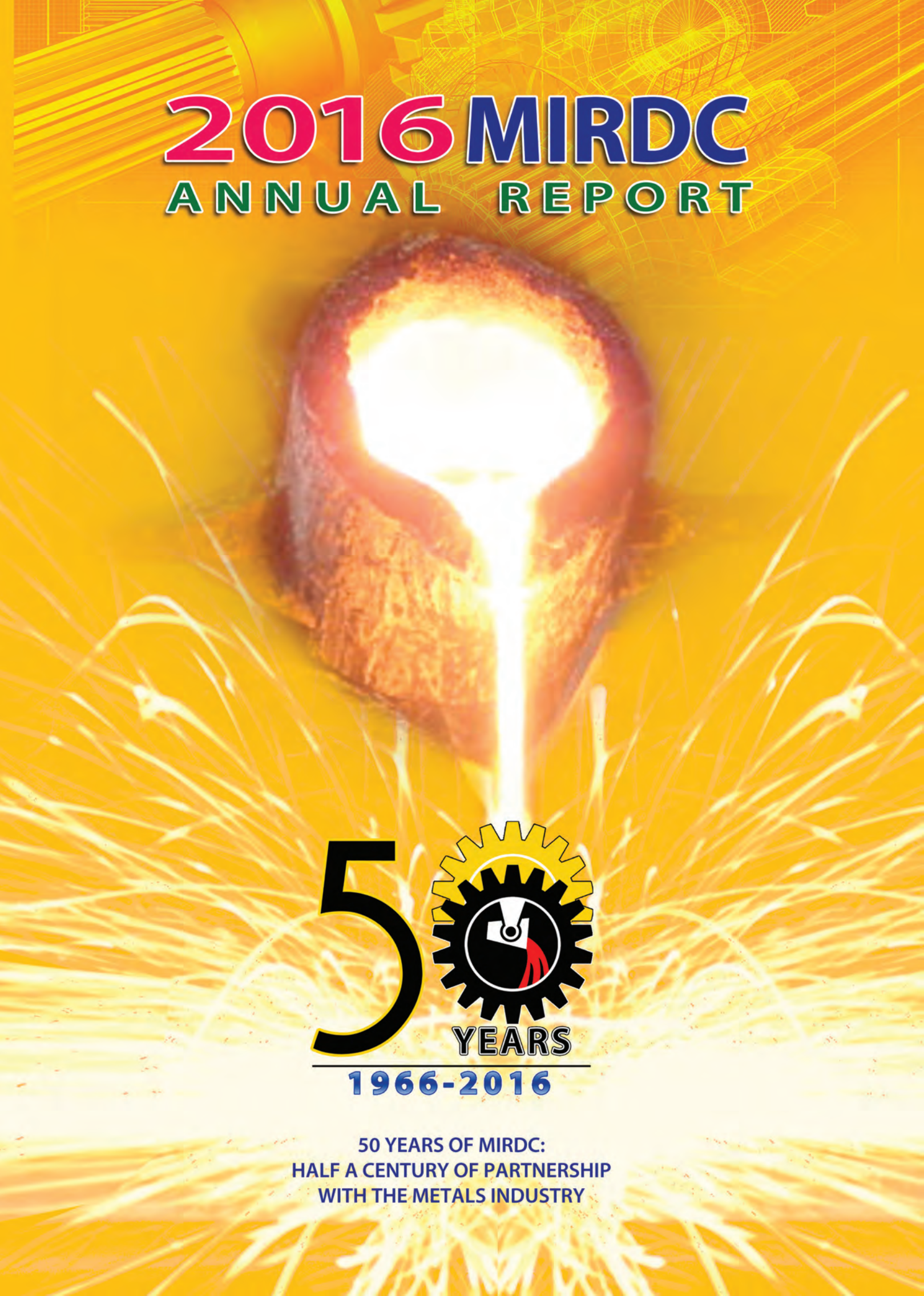
2016 MIRDC ANNUAL REPORT



50 YEARS
1966-2016

50 YEARS OF MIRDC:
HALF A CENTURY OF PARTNERSHIP
WITH THE METALS INDUSTRY

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Message from the

DOST Secretary

The Department of Science and Technology (DOST) carries the responsibility of contributing to nation-building through its science, technology, and innovation outputs. Then and now, the DOST is able to successfully bring this responsibility to fruition largely because of a harmonious interdependence among DOST agencies. This enables us to optimize our diverse pool of experts and talents, and because of each agency's effort to be more continuously relevant in creating science, technology, and innovation-based long-term solutions to the uniquely dynamic challenges of the country.

We are fortunate to have the Metals Industry Research and Development Center (DOST-MIRDC) focusing attention to and addressing issues of the local metals, engineering, and allied industries. Being one of the DOST's research and development institutes, the MIRDC provides our economy's backbone industries with the most appropriate support to enable it to enhance competitive advantage and gain better foothold as it communes with market leaders and strong players in the arena.

I commend the DOST-MIRDC for its dedication to fulfill its mission to the M&E and allied industries. This is clearly reflected in the agency's programs and projects, which definitely help make the industry more resilient. This is also evident in the wide network the Center has formed and continuously nurtures with industry associations, relevant government institutions, and the academe.

Let us continue to work together so that we can show to all Filipinos that science and technology serves the people.

Congratulations for a fruitful 2016!

FORTUNATO T. DELA PEÑA
Secretary, DOST
and Chairperson, MIRDC
Governing Council

Executive Director

With the many successes of the Department of Science and Technology – Metals Industry Research and Development Center (DOST-MIRDC), it is inevitable that some milestones stand out and shine brighter than the rest. 2016 is the year that the Center reached its 50th Founding Anniversary. Turning gold is, by far, our brightest celebration. Our 50 years of existence as an organization marks how long we have been here partnering with and focusing effort to make a difference for the metals, engineering, and allied industries.

Our golden anniversary, themed, '50 Years of MIRDC: Half a Century of Partnership with the Metals Industry,' connotes our high regard for the industry and the affiliation we have forged with them all these years. We are proud to be the agency tasked to support the M&E and allied industries, whose activities propel the nation toward global competitiveness. Our goal is really for the industry to gain the benefits from the services we offer and the programs and projects we implement. And as the Center aspires to accelerate the industries' growth, we are so delighted that we are able to foster cooperation and co-responsibility between us and our strategic partners as well.

It is with great pride that I present to you the MIRDC's 2016 Annual Report. Contained in the succeeding pages are the highlights of our 50th year – the Center's R&D initiatives that reveal our involvement in advanced transportation and agricultural machinery projects, facilities upgrading, manpower development, and promotion of S&T services, to name a few. Through it all, we have our partner associations with us, working for positive change, and catalyzing and sustaining the transformation of the local M&E industries to become world-class.

The DOST-MIRDC envisions a globally competitive M&E and allied industries driven to greater heights by science, technology, and innovation. We exist side by side with them as they face diverse challenges. Hence, we share the celebration of the Center's 50th Anniversary with our partners who are one with us in furthering the growth of the industry. May our half a century of collaboration inspire us more to be relentless in the pursuit of our shared vision.

ROBERT O. DIZON
Executive Director, MIRDC

50 Years of MIRDC: Half A Century of Partnership with The Metals Industry

We Are

VISION

Center of excellence in science, technology and innovation for a globally-competitive metals, engineering and allied industries by 2025.

MISSION

We are committed to provide both government and private sectors in the metals, engineering and allied industries with professional management and technical expertise on the training of engineers and technicians; information exchange; quality control and testing; research and development; technology transfer; and business economics and advisory services.

CORE VALUES

Professionalism	We adhere to the highest ethical standards of performance. We value our work and are committed to perform to the best of our ability.
Responsiveness	We spearhead implementation of projects that address the needs of the metals and engineering industries. We find solutions to real-life problems through science, technology and innovation.
Integrity	We act responsibly, work honestly, and encourage transparency.
Dynamism	We perform our jobs with vigor and enthusiasm. We welcome change as an opportunity for growth and continual improvement.
Excellence	We adhere to world-class performance and continuous improvement in all we do. We always do our best in every task/endeavor.

GOLD!

QUALITY & ENVIRONMENTAL POLICY

We are committed to provide products and services to both the government and the private sectors in the metals and engineering and allied industries with the highest standards of quality and reliability within our capabilities and resources and aligned to our strategic direction, to comply with applicable statutory and regulatory requirements, to plan and implement actions to address risks and opportunities and to continually improve the effectiveness of our Quality and Environmental Management Systems at all times in order to enhance customer satisfaction at all times.

We shall manage and control our activities in order to minimize adverse impacts on the environment, prevent pollution and safeguard the health and safety of all employees, stakeholders, customers, external providers and the surrounding community.

The Top Management

Dr. Agustin M. Fudolig
Deputy Executive Director for Technical Services

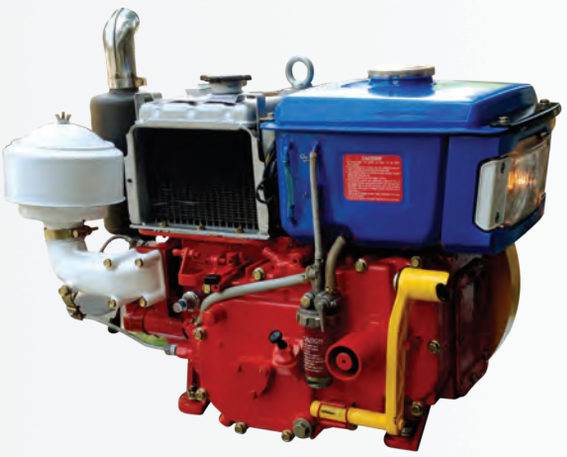
Engr. Robert O. Dizon
Executive Director, MIRDC

Engr. Jonathan Q. Puerto
Deputy Executive Director for Research and Development

Prototyping Division

Innovations and Breakthroughs for 2016 in Research and Development

The Prototyping Division (PD) achieved numerous innovations in 2016, all aimed to fast-track the enhancement of the metals, engineering, and allied industries' competitiveness through its achievements in research and development specifically in equipment prototyping, agro-industrial mechanization, and industry capability and institutional facility establishment.



The 12hp Single Cylinder Diesel Engine Prototype

Development of 12Hp Single Cylinder Diesel Engine

A small engine is the general term for a wide range of small displacement, low powered internal combustion engines used to power different agricultural and industrial equipment. Small engines improve work by providing portable power where and when it is needed. Despite the high demand for small engines in the country, there is no local Filipino company that is engaged in their production. Currently, the demand for these engines is catered only through importation.

The Department of Science and Technology through the Metals Industry Research and Development Center came up with an initiative to localize a 12hp Single Cylinder Diesel Engine in cooperation with different stakeholders from the private sector, agricultural agencies, and the academe. Ultimately, the project desires to locally develop a single cylinder diesel engine that is 20% lower in terms of cost as compared to the leading brand. Also, the project aims to establish a particular set of local manufacturers and suppliers of parts and components to sustain the local production of the engine upon commercialization.

The development of 12hp single cylinder diesel engine is now on the third year of implementation. A prototype was already tested at the Agricultural Machinery Testing and Evaluation Center (AMTEC). Test results showed that the prototype is above par against the standard performance conditions.

AMTEC tests the prototype developed by DOST-MIRDC.

Table 1. Performance Test Results of the Prototype12HP Single Cylinder Diesel Engine.

Performance Criteria	Standard	AMTEC Test
Maximum Power as Percentage of Rated Maximum Power, %	80	94.3
Continuous Power as Percentage of Rated Maximum Power, %	80	83.2
Maximum Noise Level (Continuous Running Test), dB(A)	92	90.4

Hand Tractor-attached Transplanter

Hand Tractor-attached Harvester

The various engine parts and components of the 12hp single cylinder diesel engine were fabricated. Major cast components such as flywheel, camshaft, engine block, and crankshaft including the gears were developed with industry partners.

Four (4) additional units of the 12hp single cylinder diesel engines are undergoing assembly. Actual field testing of the units coupled with different agricultural equipment to evaluate its performance and capacity will be conducted at the Philippine Center for Postharvest Development and Mechanization (PHilMec), Science City of Muñoz, Nueva Ecija.

Piloting of the Hand Tractor-attached Transplanter and Hand Tractor-attached Harvester in Selected Rice Growing Regions

The MIRDC continues its partnership with the Philippine Center for Postharvest Development and Mechanization (PHilMech) in further assessing the functionality of the locally fabricated prototype of hand tractor attachments (harvester and transplanter) that were developed in mid-2014 through the project entitled, "Design and Development of Hand Tractor Attachments (Harvester and Transplanter).

A second project entitled, "Piloting of the Hand Tractor-attached Transplanter and Hand Tractor-attached Harvester in Selected Rice Growing Regions," commenced in February 2015 with the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) as funding agency.

The Center prepared the necessary bidding documents involving the supply of labor and materials for the fabrication of three (3) units each of hand tractor-attached transplanter and hand tractor- attached harvester during the later part of 2015.

The field testing of the units in several test sites within Regions II, III, and IV-A are scheduled in Q1 and Q2 of 2017. Prospective adopters/beneficiaries where already identified in coordination with PHilMech, DA and DOST regional offices. Details are as follows:

- Region II: Silap Irrigators Association in Brgy. Roxas, Solano, Nueva Vizcaya
- Region III: Anak Bukid Producer Cooperative (ABPC) in Brgy. Sto. Rosario, Sto. Domingo, Nueva Ecija
- Region IV-A: Puypuy Farmers Association in Brgy. Puypuy, Bay, Laguna

Further, necessary documents for IP Registration were already in-process as well as the economic viability and social acceptability analysis. Other expected outputs of this project prior to its culmination in 2017 are the test protocols and operation manuals.

MIRDC team meets with potential technology adopters.

Fabricated Sugarcane Cutter

Design and Development of Sugarcane Harvesting Equipment for Small Farms

The MIRDC, in collaboration with the Sugarcane Regulatory Administration (SRA), successfully developed the Sugarcane Harvesting Equipment (Cutter, Leaf-Stripper, and Loader). This was made possible by the funding of DOST-PCAARRD under the program, "Boosting the Sugarcane Industry through Smart Farming Processing Techniques."

This set of equipment aims to mechanize the sugarcane harvesting processes such as cutting, leaf-stripping, and truck loading, and addresses the effect of the decline in labor force in the Philippine sugarcane industry. The equipment has a simple design, compact, easy to operate, and can be transported easily in between sugarcane farms. The prototypes were developed to increase the efficiency while decreasing the cost of the aforementioned sugarcane harvesting processes. Hence, directly benefiting the sugarcane industry. Currently, the three equipment's patent document requirements are being processed for the official filing of IP.

Design and Development of Sugarcane Cutter

The initial stage of sugarcane harvesting is cutting. The developed sugarcane cutter is geared towards mechanizing and increasing the efficiency of this process through improved cutting rate. The equipment is easily operated through its built-in operation and control mechanisms. It is composed of the hydraulics, input conveying, cutting, and output conveying assemblies.

The sugarcane cutter was completely fabricated last September 2016 and undergone a series of functional testing to verify its performance. Various parameters such as forward speed, working width, and theoretical capacity were gathered during its functional testing. The series of field testing is scheduled during the first quarter of 2017 to further determine its actual field performance. The series of tests will serve as the basis if modifications and improvement are necessary to amplify the cutter's performance.

Design and Development of Sugarcane Leaf-Stripper

After cutting, the harvested sugarcane stalks are either used for replanting or milled. The stalks for milling are usually leaf-stripped prior to being brought to the milling facility. However, manual stripping does not completely remove the unnecessary leaves on sugarcane stalks hence, diminishing its market value. Stalks brought for milling must be thoroughly cleaned and undamaged.

The sugarcane leaf-stripper aims to mechanize the cleaning and removing of unnecessary leaves on sugarcane stalks in preparation for their post-harvesting processes. The equipment is simple in design, compact, and has a built-in sugarcane-top cutter which cuts the leafy part of the stalk. Moreover, the machine can be operated with only two (2) person-

Functional Testing of Sugarcane Cutter.

Operation of Sugarcane Leaf-Stripper.

Fabricated Sugarcane Leaf-Stripper

Table 2. Test Results Gathered from the Field Testing of the Leaf-Stripper

Parameter	Data	
	1st Test (CADP)	2nd Test (SRA-LAREC)
Capacity (Ton Cane/Day)*	2.00	4.66
Fuel Consumption (L/hr)	0.67	0.5
De-trashing Efficiency (%)	96.5	99
Noise Level (dB)	96	96
Operator Required	2	2
Number of Cane Stalk per Load	2-3	
De-trashing Mechanism	Brush-Type	
Transport Method	Pull Type	
Input/Output Mechanism	Roller-Type	

nel and can be transported easily in between sugarcane farms with its built-in hitch connection on its chassis. The leaf-stripping mechanism of the machine, which works by friction, is mainly composed of rotating brushes. Its input and output mechanisms work by rollers. In addition, the distance between the de-trashing components and the rollers can be adjusted depending on the cane size and variety.

The prototype's functionality was tested after fabrication. Moreover, field testing of the equipment were conducted last April and October 2016 at Central Azucarera Don Pedro (CADP), Nasugbu, Batangas and Sugar Regulatory Administration - Luzon Agricultural Research and Extension Center (SRA-LAREC), Paguiruan, Floridablanca, Pampanga. The test results are shown in Table 2.

The sugarcane leaf-stripper has undergone design modifications prior to its second field testing in SRA-LAREC sugarcane farms hence, the improvement in the equipment's performance. The modifications incorporated were based from the drawbacks encountered in the initial field testing.

Design and Development of Sugarcane Loader

After being thoroughly stripped off of their leaves, the stalks for milling are manually loaded into a transport vehicle, and then taken to the milling facility for postharvest processing. Manual loading of the harvested sugarcane stalks is a tedious task for the farmers which decreases loading efficiency and expected amount of processed sugarcane. In the long run, these setbacks

Fabricated Sugarcane Loader

Operation of Sugarcane Loader.

affect the productivity of the domestic sugarcane industry.

The sugarcane loader addresses these difficulties and mechanizes the loading of sugarcane stalks into the transport vehicles. Likewise, the inefficiencies and delay caused by manual loading are eliminated thus, fast-tracking the postharvest processing of sugarcane. The loading mechanism of the machine is by vertical reciprocation actuated by the weight of stalks trough the loading arm. The equipment can load about 35 kgs per loading.

The sugarcane loader's functionality was tested after fabrication. Field testings of the equipment were conducted last April and October 2016 at Central Azucarera Don Pedro (CADP), Nasugbu, Batangas and Sugar Regulatory Administration - Luzon Agricultural Research and Extension Center (SRA-LAREC), Paguiruan, Floridablanca, Pampanga. Results are presented in Table 3.

Table 3. Test Results Gathered from The Field Testing of the Sugarcane Loader

Parameter	Data	
	1st Test (CADP)	2nd Test (SRA-LAREC)
Capacity (Ton Cane/Day)*	41.44	117.6
Fuel Consumption (L/hr)	0.97	1.46
Noise Level (dB)	86.5	86.5
Operator Required	2	2
Loading Mechanism	Vertical Reciprocation	
Transport Method	Pull Type/Truck Attached	

After the first testing in the CAPD, a modification was made addressing the weakness of the prototype. This resulted to an evident increase in capacity of the loader during the second testing held in SRA-LAREC. Series of field tests are scheduled to validate the initial results after the modification.

Design and Development of Superheated Steam Treatment System (SSTS) for Stabilized Brown Rice

The project "Design and Development of Superheated Steam Treatment System for Stabilized Brown Rice," implemented in 2013, aims to extend the shelf life of brown rice from 1-2 months to 5-9 months. The project is also in accordance with the national program of the government regarding rice sufficiency. Further, this addressed the DOST's R&D initia-

Loading Unit of the SSTS

The Batch Type Superheated Steam Treatment System.

Treatment Unit

Treatment Unit

Cooling Unit

Superheated Steam Generator

tives for brown rice to stabilize factors affecting the stability and acceptability of brown rice after processing and storage.

The initial prototype was a batch-type one which was launched in 2015. Observation, optimization, and standardization tests were conducted to ascertain the optimum performance of the system in prolonging the shelf-life of brown rice. Treated brown rice was evaluated in terms of shelf-life, physicochemical, chemical and sensory properties. Based on the results of the evaluation made by the Food and Nutrition Research Institute (FNRI), the batch type successfully attained the project objective.

The other prototype is a continuous type SSTS. The system was designed and developed in accordance with the results of the optimization tests during the development of the batch type SSTS. The distinct feature of this system against the batch type is that, aside from its continuous treatment process, it has a mechanism inside the treatment chamber that controls the duration of exposure of brown rice to superheated steam simultaneous with the mixing action to facilitate uniform treatment of brown rice.

The system requires a 5.75m x 6.5m area for its installation. It is composed of ***a) loading unit*** that serves as reservoir for untreated brown rice and facilitates synchronized feeding to the treatment unit; ***b) treatment unit*** where actual treatment of brown rice with superheated steam takes place; ***c) cooling unit*** that cools down treated brown rice to a temperature tolerable for handling; ***d) superheated steam generator unit*** which is composed of a boiler that provides saturated steam and a superheater that elevates the saturated steam temperature to create a superheated steam; and ***e) a control unit*** that sends and receives signal from every component to synchronize its sequence of activities and implement settings of operation. It also actuates the automatic or manual manner of operation.

Forage Chopper Equipment

Design and Development of Forage - Blade and Chopper for Goat Production

The project was implemented to develop a Forage Chopper for Indigofera zollegeriana and other feeds such as Napier grass for goats. Chopper blades were also developed to address the need for replacement blades of idle choppers due to lack of blade supplier.

In the course of the project, the team traveled to the Small Ruminant Center (SRC) of the Central Luzon State University (CLSU), Science City of Muñoz, Nueva Ecija where a number of forage choppers are housed. From these, three (3) were selected and their blades replaced. The design of the MIRDC-CLSU Forage Chopper was based on those of the selected existing forage choppers leading to the fabrication of a prototype.

Both blades choppers were subjected to functional test, followed by performance tests which the AMTEC conducted. The conduct of tests served as one of the highlights of the project.

Testing of the MIRDC-CLSU Forage Chopper was successful; the official result from the AMTEC is shown in Table 4.

Following the successful performance test of the MIRDC Forage Chopper, a Turnover Ceremony was held last 11 August 2016 between the MIRDC and

Table 4. Test result of the MIRDC-CLSU Forage Chopper

Feed	Capacity (Kg/Hr)	Fuel Consumption (L/Hr)
Indigofera zollegeriana	620	1.55
Napier grass	896	1.08

The new rotary blade (inverted) for the front cutting forage chopper and the replaced blade (bottom).

(Center picture) The old (top) and new (bottom) rotary blades. (Right picture) The stationary blades, new (left) and the original (right).

The Tikog plant

Engr. Jonathan Q. Puerto (6th from left), Deputy Executive Director for R&D, Metals Industry Research and Development Center (MIRDC), hands to Dr. Tereso A. Abella, President of the Central Luzon State University (CLSU), a certificate of turnover of the Forage Chopper for Goat Production Project with Dr. Edgar A. Orden, VP for Business Affairs and Director of the CLSU-Small Ruminant Center (SRC) , Dr. Fe L. Porciuncula, Vice President for Research, Extension and Training of the university and Dr. Ma. Excelsis M. Orden, Research Office. Also in the photo are the Provincial DOST and other MIRDC Officials (left).

Pounding of tikog.

Conventional way of performing "lagot."

CLSU with the officials of the Provincial Science and Technology Office of DOST. The activity was held at CLSU, Science City of Muñoz, Nueva Ecija.

Design and Development of Tikog Flattening Machine

"Tikog" is a weedlike plant that belongs to the sedges family. It has a slender stem approximately 3-4 millimeters in diameter and about 1.5 to 1.7 meters long when fully matured. It grows together with other grasses to serve as its support while growing tall. The local people usually plant this sedge at a distance of about 1.5 by 1.5 meters apart. It is usually harvested fresh with green color, then sun dried prior to pounding ("bayo") for about 30 minutes using a round wooden object known as pestle.

After pounding, the tikog plant undergoes a process known in local dialect as "lagot." It is done by pulling the pounded tikog between a folded cloth supported by a piece of wood and a straight-edged slot of wood or bamboo. This is done several times for a few minutes. This process makes the surface of the tikog plant even which makes a better quality of tikog handicraft products.

Previously, "lagot" is done by weavers using their foot instead of cloth which sometimes cause abrasion on the women's skin, until they discovered the use of cloth.

Due to the tedious and long process of flattening tikog,

Turnover of "Tikog Flattening Machine" held on September 16, 2016 in Tacloban, Leyte.

the women's association in Basey, Eastern Samar wishes to lessen the weavers' burdens by mechanizing the flattening of tikog and consequently produce better and a higher volume of output.

In response to the call from the women weavers' association, MIRDC in partnership with CARE Philippines, developed a mechanical flattening machine that alleviates the burdens of women weavers in the municipality of Basey. The machine is able to simultaneously perform both "bayo" and "lagot" with less effort from women. The project was turned over last September 16, 2016 to CARE Philippines and to the women weavers of Basey, Eastern Samar.

Prototyping and Pilot Production of Eyelet Riveter/ Eyelet Machine

Eyelet riveter is a simple and yet an important piece of office equipment to the operation of the Department of Foreign Affairs' Authentication Divison- Office of the Consular Affairs (DFA AD-OCA). It has been part of their daily task to process, bind and attach ribbons to diplomatic documents which make up their overall output. However, over a period of time, its ageing eyelet riveters have become defective and require replacement. Unfortunately, replacement is not that simple as the original manufacturer is no longer in business. The situation paved the way for the MIRDC to improve the replacement units.

MIRDC, being a research and development institution, entered into an agreement for the prototyping and piloting of local eyelet riveter for use in all the DFA satellite offices in the Philippines and embassies abroad.

The eyelet riveter set

The final delivery of eyelet riveter done last September 30, 2016.

Among the improvements introduced are: the longer handle to lessen the force necessary to actuate it; the cascading opening of the hopper to avoid spilling the rivet during loading; and the modifications of the internal components and housing which enable full localization.

Three (3) prototypes and 130 units were pilot produced and were completed by September 30, 2016. The said riveters will be distributed to the different local and foreign consular affair's offices.

Along with the riveters are the operations manuals, the spare parts for wearable parts, lubricants, and allen wrenches for adjustment.

Enhancing Tool and Die Industry Competitiveness by Expanding the Pool of Trained and Highly Skilled Die and Mold Designers and Makers (D2M2 Project)

A total of four (4) batches or eighty (80) beneficiaries of free training of personnel from private firms and academe proudly received their certificates of training in 2016.

The training program, referred to as the D2M2 Project, which was implemented by the DOST-MIRDC in April 2015 under the DOST's Makinarya at Teknolohiya Para sa Bayan (MakiBayan) initiative with close cooperation and support of PDMA, Inc., was co-funded by the Board of Investments (BOI), one of the agencies of the Department of Trade and Industry (DTI). The D2M2 Project aims to produce an expanded pool of trained tool, die and mold personnel to address the existing deficiency in the number of skilled manpower. This in turn will enhance the competitiveness of the local tool and die sector in support of the automotive industry through manpower development and project output assessment activities.

Specifically, the training intends to enable the trainee-participants to identify different types of material used in the die/mold fabrication, as well as to design, fabricate and repair simple and complex dies and molds using CAD/CAM in accordance with the ISO standard.

Batch 2: July 1, 2015 – February 23, 2016.

Batch 3: October 1, 2015 – June 2, 2016.

Batch 4 (Special Batch): December 4, 2015 – July 15, 2016.

Batch 5: April 12, 2016 – October 24, 2016.

D2M2 trainees in action.

The six-month (1,056 hours) training covers the following modules – Technical Drawing, Dimensional Metrology, Material Selection, Safety & Maintenance and Heat Treatment. The curriculum highlighted the machining and programming courses – CNC Turning and Milling, CNC-EDM Wire-Cutting and Sinking and CNC-5-Axis. The trainees were heavily engaged with the major courses in designing – CAD Fundamentals and the specialized courses – Die Design and Plastic Injection Mold Design. As part of the training program, plant tours were conducted in order to enhance the experience and awareness of trainees on the different processes and machines used by the die and mold companies thus, oriented the trainees to a more complex world of die and mold. As an add-on to this long-term training, MIRDC partners were tapped to conduct a series of short technical seminars to the trainee-participants. The acquired knowledge of the D2M2 trainee-graduates was showcased through their project presentations during graduation.

A special batch (Batch 4) of trainee-participants, composed of faculty members/instructors from the academe, was launched. This is the outcome of the strategic collaboration through focus group discussions with academic institutions to address the challenges encountered during the scouting of prospective trainees. It was observed by the Technical Working Group (TWG) that the basic/fundamental knowledge and skills of the applicants, who are graduates of vocational/technical courses, are mostly below par than the entry level requirements. Since the instructors perform important roles in building the necessary foundation for the graduates, the TWG tailored the existing curriculum (excluding topics that are already common in the academe) for the instructors to upgrade and update their knowledge and skills on more advanced or latest technologies on die and mold designing and making. Embracing this premise helps to ensure that high calibre and industry-ready future die and mold designers and makers will be produced.

The tool and die industry benefits through the products of the D2M2 Project, as it develops highly skilled designers and makers. The supply of improved manpower remarkably contributes to academic institutions and

Clockwise from top left: Engr. Robert O. Dizon, MIRDC Executive Director, welcomes all the guests; Mr. Amelito E. Umali (center), Chief of the Heavy Industries Division of the DTI-BOI receives a plaque of appreciation from MIRDC after delivering his message; Engr. Fred P. Liza, Chief of Prototyping Division and Project Leader of D2M2 Project expresses his gratitude to the DTI-BOI, PDMA, Inc., Resource Persons, Technical Assistants, Project Management Team and Staff, Consultant, Partner Support Organizations, etc. for their contributions to the great success of the project; and Mr. Virgilio F. Lanzuela of PDMA, Inc. delivers his message.

Engr. Elenita P. San Juan, D2M2 Project Consultant, presents the Final Evaluation Report.

local manufacturing sectors. In view of this, the MIRDC proposed a continuation of training for another three years which would be a great privilege for soon-to-be die and mold practitioners/experts.

The D2M2 Project was completed in December 2016. A Closing Ceremony was held on December 20, 2016 at the newly renovated Titanium Auditorium, MWS II Building, within the MIRDC Compound. The Final Assessment/Evaluation of the D2M2 Project was the highlight of this event. Engr. Elenita P. San Juan, D2M2 Project Consultant, said that the project was successful in achieving the key targets and met all the objectives though there are some areas for improvement. She presented briefly the evaluation findings, problems encountered, conclusions, and recommendations. Engr. San Juan concluded her presentation by saying that answering the need of the tool and die industry is a huge task which may take years to fulfil. However, the proposed continuation of the D2M2 Project, including other projects in the pipeline as an offshoot of D2M2, coupled with MIRDC's state-of-the-art equipment capable of developing highly skilled die and mold makers, and with the unwavering support of PDMA, Inc. and DTI-BOI, the project is surely heading towards the fulfilment of its goals.

Establishment of a Gear Making and Assembly Facility

The project "Establishment of a Gear Making and Assembly Facility" supports the Makinarya at Teknolohiya para sa Bayan (MakiBayan) initiative which aims to improve the competitiveness of the metalworking industry. This facility will likewise enhance local capabilities for gear design and production, and develop gear assembly manufacturing industry for transport, metalworking and agro-industrial applications. At present, very few companies in the Philippines are engaged in the design and manufacture of gears. The limited number of gear manufacturers is attributed to the high cost of investment in machinery. Hence, the DOST-MIRDC implemented the project to address the gap in the design and manufacture of gears and offer gear making technologies and facility to the manufacturing industries.


MWS I Phase 3 (Machine and QA Rooms)


MWS I Phase 5 (Training and Office Rooms)

Newly acquired equipment (from left): 5-Axis CNC Machine Okuma MU6300V, Gear Hobbing Machine GE25A, and Dynamic Balancer CMAT CMT 1500.

Along with the establishment of the gear making facility is the renovation of the building to house the acquired equipment. In 2016, the renovation of the MWS I Phases 3 & 5 was completed including the electrical system and accessory requirements (e.g. MDP, Switch Gear, etc.).

Among the equipment acquired for gear making are: the Okuma 5-Axis Vertical Machining Center MU-6300V, CNC Gear Hobbing Machine (GE25A), CNC Gear Shaping Machine (ST25CNC), Gear Shaving Machine (FE30A), Gear Measuring Machine (DuraMax RT) and CIMAT Dynamic Balancing Machine (CMT-1500 H2P). Also acquired is a design software for gear (KISSsoft and KISSsys), the former performs accurate size calculations for machine elements while the latter depicts a complete system of machine elements and is used for strength calculation of each element.

This project was successfully launched at the MIRDC Platinum Auditorium, MWS I Building. As part of the DOST's "Juan Science, One Nation: 2016 National Science and Technology Week (NSTW)," the commencement of the gear making event brought together distinctive individuals coming from several agencies, private and public organizations and academic and technological institutions.

The MIRDC's Gear Making Facility was showcased in the DOST's National Science and Technology Week (NSTW) from 25-29 July 2016 and in the Philippine Die and Mould Machineries and Equipment Exhibition (PDMEx) on August 23-26, 2017 held at the World Trade Center, Pasay City.

(From left to right): Project Leader Dr. Dominic S. Guevarra's presentation during the launching of the gear making facility; Dr. Guevarra with MIAP board members; and MIRDC Director Robert O. Dizon (center) with MIRDC and Partner Industry Officials during the ribbon cutting ceremony.

Materials and Process Research Division

Proactively Aiming for Delivery of R&D Services that Truly Matter

Fueled with the aspiration to propel the metals, engineering, and allied industries toward a more advantageous and competitive position, the Materials and Process Research Division (MPRD) carried out the implementation of R&D projects envisioned to strategically provide reliable and long-term science and technology-based solutions to the industries' rapidly changing issues and challenges.

Braking distance test of the Hybrid Electric Train (HET) at PNR Solis (Tondo,Manila).

Development of Prototype Trainset

The DOST Hybrid Electric Trainset (HET) under the project "Development of Prototype Trainset" achieved its objectives through the fabrication and assembly of a five-coach train set, a control system and production of locally fabricated train parts. This is in line with the DOST-MIRDC's Support Program for the Productivity and Competitiveness of the Metals and Engineering Industries.

Alongside the objective to develop local train parts, the HET project team, in partnership with the DOST Project Management and Engineering Design Services Office (PMEDSO), designed and fabricated semi-permanent couplers. These couplers have a high compressive and tensile strength and pivotal angle that can handle swivels and tension between the connected coaches. It also underwent heat treatment process to increase the materials' strength and wear resistance. The coupler is able to withstand 1188 kN of tensile force as tested using the Universal Testing Machine (UTM) from the Auto-parts Testing Facility of MIRDC.

In June 2016, the HET was successfully promoted to the public through a media launching at the Philippine National Railways (PNR) Tutuban Central Station that was attended by the former DOST Secretary Mario G. Montejo and the current Secretary Fortunato T. de la Peña. Then Secretary Montejo stated that the train produced by the Center would be the first hybrid electric train in the country and would be the start of the breakthrough for the rail technology. He also added that the DOST has already extended its effort to endorse the technology to the private sector which could build partnerships and strengthen the country's metal industry. On the other hand, Secretary de la Peña declared his support and shared his vision for the DOST-MIRDC's HET technology as a solution to the worsening traffic problem on our country's transport system.

A series of functional and performance testing of the prototype HET set was conducted at the PNR Depot Caloocan from April to June 2016 such as: measurement of fuel consumption per hour of the generator set, component tests and braking distance tests to be able to establish its operation-related parameters. After the successful media launch, the testing was continued at the PNR Tutuban-Solis Station rails to be able to identify more vital parameters for the speed tests, acceleration tests, load tests and endurance tests which needed longer rail tracks and varying track grades. The said tests are projected to continue until October 2017.

DOST-MIRDC was also able to continue and enrich its partnership with PNR as the Center's beneficiary. In return, PNR provided the project team a dedicated track and line service assistance during testing. All of the test procedures will be published on the

Incoming DOST Secretary Fortunato T. de la Peña attended the media launching of the Hybrid Electric Train (HET).

The media launching of the Hybrid Electric Train (HET) was attended by the then outgoing DOST Secretary Mario G. Montejo (left) together with the PNR General Manager Allan Joseph Dilay (center) and PNR Chairman Manuel Torres (right).

performance test protocol that is being developed by the project team including the on-going developments of the testing. The data and parameters that will be measured would serve as the reference for the gap analysis and certification of the train set.

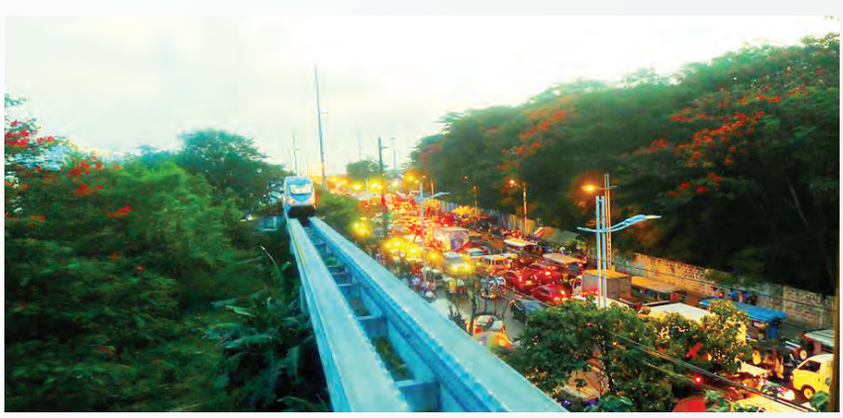
Automated Guideway Transit System

Have you been caught up in traffic jams? Driving and commuting around the city is not that easy. Numerous transport and traffic schemes have been studied and already implemented by the government just to relieve the people from traffic mayhem. But, these are still not sufficient to guarantee anyone from not experiencing being stuck in traffic jams. Add to this traffic problem is the insufficient, inefficient and inconvenient modes of transportation. In a Japan International Cooperation Agency (JICA) study, congested streets and traffic jams cost the country as much as Php 2.4 billion a day in lost productivity and potential income and this may increase to Php 6 billion a day by 2030 if the government does not provide intervention now[1]. For these reasons, strengthening the urban mass transportation particularly the rail system is being pushed by transportation experts and various sectors. Presently, commuting using the MRT-3 is faster and more convenient for commuters especially during rush hours. However, importing these rail systems will need high investment cost and, in the long run, high maintenance cost since most of the components used are customized.

In view of this, the Department of Science and Technology (DOST) through the Metals Industry Research and Development Center (MIRDC) developed an alternative technology solution that is safe, convenient and environment friendly. The Automated Guideway Transit (AGT) system is a locally developed and locally designed mass transport system by Filipino engineers and workers made to suit local settings. To date, two prototypes have been developed. The bigger version in Bicutan has two-articulated coaches that can carry 240 passengers at a time and envisioned to be adopted in major thoroughfares, while the smaller version, also has two-articulated coaches, originally has a capacity of 30 passengers each coach. But after converting to double tire system, it can now carry 100-120 passengers at a time. Both prototypes have been subjected to extensive test and evaluation and have covered approximately 6,000 kilometers each to validate their integrity and identify further improvements.

Virtual AGT

In 2016, the National Economic and Development Authority (NEDA) approved the funding of the Feasibility Study



The AGT Bicutan and the traffic situation along Gen. Santos Ave. during rush hour.

[1] https://www.jica.go.jp/english/news/field/2014/140925_03.html

Table 1. Operating Characteristics of the Virtual AGT

Virtual AGT	Values
Maximum speed	50 km/h (with safety factor)
Average Commercial Speed	25-28 km/h
Dimension (L x W) per train	24 m x 2.5 m
Train capacity (5pax/m²)	300 pax
Construction	100% viaduct
Station platform length	40 m (to accommodate additional element to make 3-car trains)
Recommended headway	3 min
Station dwell time	20-30 seconds
Rolling stock (peak hour operation)	10 trains (20 cars)
Reserve	2 trains (4 cars)
Total rolling stock	12 trains (24 cars)
Maximum ridership	5,000 to 6,000 PPHPD
Fare (boarding fee + per kilometer)	Php 11+1
Length one way	6 km
Length whole round trip	12 km
Number of stations	2 terminal stations and 6 intermediate stations
	(total of 7 inter-stations)
Average distance between stations	Around 850 meters

of AGT System proposed by MIRDC. Systra Philippines, Inc., rail experts with head office in France, were tapped to spearhead the feasibility study. To better understand the technology and to establish basis in their feasibility study, Systra conducted a Value Engineering/Value Analysis (VE/VA) of the AGT. Two French experts on transportation and rolling stocks arrived in the country to assess the AGT and came up with a list of proposed improvements and additional systems to meet minimum standards for a train system, mostly addressing safety and reliability of the AGT. From these technical assessments, a "Virtual AGT" was established to come up with a theoretical framework identifying the realistic operational parameters of the current design and prototype of the bigger AGT. MIRDC provided the technical specifications as well as the initial general cost estimates. Shown in Table 1 above are the operational characteristics of the "Virtual AGT."

The AGT is a safe, convenient and environment-friendly alternative technology solution to mass transportation.

AGT compared to other Modes of Transportation

Although the position of the AGT in the hierarchy of transportation modes cannot exactly be determined since the AGT is not fully operational and its operational characteristics are not fully defined yet, the consultant nonetheless positioned the AGT based on the established operational characteristics and "virtual improvements" of the Virtual AGT. It is found to be closest to the bus with high level of service (BHLS), the cable car, the urban tram, and the mini monorail as seen in Figure 1.

Value Analysis

A Value Analysis exercise was conducted on the AGT System as a project following the guidelines in the NEDA Value Analysis Handbook to define, review and analyze the AGT functions in order to determine which need improvement, elimination or creation to meet the study's goals. Below are some of the highlights of the exercise done.

1. Given the context (tight budget, limited team, short time, etc.): there are already effective and encouraging results.

2. The DOST recognizes that further development is needed before an alternative and reliable complete transport prod-

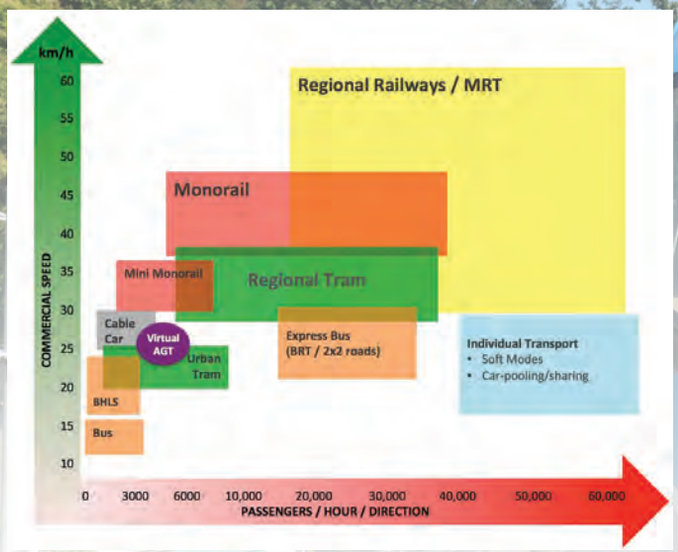


Fig. 1. The Virtual AGT within the hierarchy of transport modes. - Source: SYSTRA

uct/solution can be proposed in Metro Manila and other cities/ municipalities.

3. A locally manufactured transport system may generate lower acquisition costs (CAPEX).

4. Safety concerns are incompletely addressed.

5. Other threats exist, and among them:

- competition from established technologies and suppliers;
- long term sustainability;
- standards: certification phase should be considered at all levels of development;
- to include design (which standards, for what, with whom and how) – this is a persistent concern in the Philippines where transport related standards are practically inexistent.

6. Assuming that improvements are done according to his recommendations, the Consultant positions the Virtual AGT between the BHLS, the cable car, the urban tramway and the mini monorail.

7. At the current stage of development, the Virtual AGT's maximum transport capacity can be estimated at 5,000-6,000 PPHPD, and its commercial speed at 25-28 km/h.

8. Several mass transit system projects in Metro Manila are under study or construction. However, they are not sufficient to ensure a comprehensive citywide integrated public transport network with a complete city network (and thus, an optimized coverage and levels of service adapted to the effective and changing demand) and a clear hierarchy between the primary, secondary and tertiary routes (and their corresponding functions and levels of service).

9. The Virtual AGT can play a major role in secondary routes providing high quality feeder services (higher than what are currently provided by buses and jeepneys). It may connect, for example, airport terminals or entertainment parks to parking spaces or to the primary transport network (i.e., interconnect NAIA 1/2/3 to park-and-fly facilities). It may also connect areas that are currently located too far from the primary network, and, albeit dense, sometimes with major facilities or landmarks: museums, hospitals, universities, etc. (i.e., universities along Katipunan Avenue to LRT2 / MRT7).

Selection of AGT Corridors

With the conclusion that the AGT System should be considered as feeder complement within the context of the public transport system in Metro Manila, the corridor selection process proceeded. The primary consideration was to review the major road network of the city composed of several ring and radial roads that are served by major bus and jeepney routes and the mass transit network composed by light and heavy rail systems. The list of potential routes was subjected to an established multi-criteria analysis using the Virtual AGT parameters to rank the corridors. Out of the list, the Ortigas route (from Aurora Blvd. to EDSA) ranked number 1. MIRDC requested that the second corridor to be studied be Shaw Blvd. instead of E. Rodriguez, which was ranked number 2, in order to test the

Map of Ortigas Ave. and Shaw Blvd.

possible use of multiple car units in the corridor. Refer to the map above for better appreciation of the two routes.

Results of the Feasibility Studies can be considered as go/no-go exercises to determine whether further or full-blown Feasibility Studies should be pursued downstream.

Financial and Economic Analyses

Table 2 summarizes the macro assumptions used in the study. Table 3 shows the summary of financial indicators.

Financial analyses show that, although project returns are low, equity returns are high and can be attractive to investors even in the absence of or with limited government subsidy or guarantee. It should be noted, however, that soft costs (project development, financial closure, legal fees, related studies, owner and government engineers, etc.), are not included because they could not yet be fully defined and estimated. Depending on the resulting amount, inclusion of these soft costs may substantially reduce the financial indicators to an extent that private sector appetite is affected.

Meanwhile, Table 4 details the resulting economic indicators. For a project to be considered economically viable, its economic indicators will have to meet certain conditions:

- Economic Internal Rate of Return (EIRR) > 15%, the Social Discount Rate set by NEDA
- Economic Net Present Value (ENPV) > 0 when the Social Discount Rate is used for discounting

It will be noted that only the Shaw Line is deemed economically viable because it projects an EIRR higher than 15% and a positive ENPV. On the other hand, the economic indicators for the Ortigas Line do not meet the required conditions.

Table 2. Macro Assumptions used

	Ortigas Route
Length of the Line	3.5 km
Average Trip Length	2.9 km (fixed)
Number of Stations	6 (2 terminal, 4 intermmediate)
Passenger Increase	2-3% per annum
Inflation	4%
Revenue annualization	360 days
Operations annualization	360 days
Fare (2016 price)	11 pesos base, 1 peso per km
Fare Increase	4%
Project Implementation	2017-2045 (including 3 year construction period)

Table 3. Financial Indicators

	Ortigas Route
Project IRR	8.21%
Equity IRR	11.90%
Project NPV @15% discount rate	Php -227.74 Mn
Equity NPV @15% discount rate	Php 1,577.64 Mn

Table 4. Economic Indicators

Indicator	Ortigas
EIRR	4.10%
ENPV at 15%	Php -3,300 Mn

Summary

The following are the conclusions of the study:

1. DOST's AGT system reveals effective and encouraging results, given the tight budgets, limited team, and the relatively short period of time spent for development.

2. The technical assessment of the rolling stock experts are the steps to be taken in order for the AGT to reach a mature level that is ready for certification and commercial operations.

3. The AGT appears as a good compromise to serve as feeder system in Metro Manila, and in large urban environments such as Cebu and Davao.

4. The AGT has the potential to act as a primary mode of transport to immediately decongest major thoroughfares in smaller urban areas.

5. The AGT's future should focus on the development of an integrated transport system that includes all related systems and subsystems (rolling stock, signaling, power supply, depot, switching, emergency evacuation, fare collection, etc.).

6. In order to improve the current technology, the DOST should invest in, among others, the following:
- A longer test track (to test acceleration, deceleration, emergency braking, switching, emergency evacuation, etc.)
- A dedicated testing laboratory (for the development of electronic systems and subsystems)

7. Engage international experts to further the development of an integrated system (not only the rolling stock).

8. Once system development is complete, engage the appropriate agency to certify the system.

9. Revisit and update the study every 12 to 24 months to re-assess:
- Technology progress
- Cost impact of all recommendations
- Feasibility of corridors

10. To fast track the technology development, MIRDC may enter into agreements with existing system and subsystem manufacturer/s while awaiting full development and certification of systems under local development.

Design and Optimization of Austenitic Manganese Steel Liners for Philippine Aggregates and Mineral Processing

In aggregate crushing operation, the crusher's liners are one of the wear resistant parts used. In some instances, these parts fail by cracking during service

Bottom-pour ladle at Hong Shing Foundry.

Bottom-pour ladles with different capacities at East Sun Steel and Iron.

resulting to a sudden plant shut down. In a study conducted by MPRD in 2015, it was gathered that liners, both OEM and locally manufactured, have varying service life. Mostly, they result into a premature failure before they even reach expected full worn out state. These problems are caused by inconsistent manufacturing practices and inadequate production equipment.

Jaw Plate Castings

Fully worn-out jaw crusher liner.
Achieving a fully worn-out jaw plate is one of the objectives of the AMS Project

In June 2016, the MPRD started working on a two-year project funded by the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) entitled, "Design and Optimization of Austenitic Manganese Steel Liners for Philippine Aggregates and Mineral Processing," which aims to upgrade the capabilities of local foundries to produce manganese steel crusher liners that can effectively compete with foreign foundries in performance, value and overall cost of ownership. In this way, the dependence on imported liners can be reduced or entirely disregarded.

Part of the improvement of crusher liner is the actual casting using a Bottom Pour Ladle (BPL) which is not being used by local foundries in the Philippines. For this type of ladle, a stopper rod is inserted into a tapping hole (nozzle) in the bottom of the ladle. To pour metal, the stopper is raised vertically to allow the metal to flow out the bottom of the ladle. To stop pouring, the stopper rod is inserted back into the drain hole. Medium and large ladles are suspended from a crane. The mechanism to raise the stopper rod is hand op-



(From top left to bottom right) Plant visits and meetings at Shin Yi Precision Casting Co., Ltd.; Yeong Luh Enterprises; Hei Full Industrial Co. Ltd.; Shang Li Electric Mach. Co., Ltd.

erated. And since there are no locally available information on the operation and maintenance of BPL, the project team visited several casting companies in Taiwan last 5-9 September 2016:

- Visit at Hong Shing Foundry, Taiwan

All ladles in Hong Shing Foundry is of bottom-pour type. The bottom-pour ladle is indeed standard and the preferred ladle for pouring of large castings.

- Visit at East Sun Steel and Iron, Taiwan

East Sun Steel & Iron has been in the foundry business since 1971. They have significant experience with regard to crusher liners. They produce manganese steel liners similar to the castings for study in the AMS project. They even export to the Philippines for some Taiwanese aggregate companies operating in the country. The project team was able to consult on several problems experienced by the partner user (Electa Tarlac Aggregate Corp.).

The information/data gathered from the visits were used to support the purchasing of the Bottom Pour Ladle.

The project team was also able to visit and establish linkages with other casting industry related companies in Taiwan: (a) Shin Yi Precision Casting Co. Ltd. – a casting company that produces cast parts for precision instruments, golf head, quick coupling connectors, sewing and textile machines, food processing machines, pump and air compressors, weapons, valves and bronze; (b) Hei Full Industrial Co., Ltd. - Investment cast parts in steel, stainless steel, high alloy steel; various machinery parts for: pneumatic tools, fluid equipment, auto marine hardware, food machinery, textile machinery, pipe fittings, and military equipment; (c) President Co., Ltd. - a fully equipped laboratory and pilot foundry for characterization and evaluation of investment casting materials. They also supply refractories and alloys for investment casting; (d) Yeong Luh Enterprise - considered as the top Taiwan-based equipment manufacturer for investment casting equipment specializing in all turn-key production equipment and accessories of precision casting process and special purpose design, equipment for investment casting including wax injection, slurry mixer, dewaxing autoclave, sintering and casting, crust breaking and cut-off, post processing, sand-blasting, etc.

PRS Investment Casting Activity for NSTW 2016

The Process Research Section (PRS) of the Materials and Process Research Division (MPRD) of MIRDC conducted a demonstration of the investment casting process for NSTW 2016. The activity gave the NSTW participants a comprehensive lecture on the process and products of

Mr. Matthew Ivan Marasigan and Ms. Annalou Wy provide the NSTW participants an overview of the investment casting process.

investment casting as well as actual experience on some of these processes. The activity was made possible with the participation of this year's PRS On-the-Job Trainees (OJTs), namely: Eljhon Lapad and Maricel Villamor of MSU-IIT and Annalou Wy, Matthew Ivan Marasigan and Jamaeca Perez of UP Diliman. The OJTs handled the planning, preparations and general coordination while the PRS personnel provided the technical expertise.

The presentation of the Investment Casting process was divided into 5 segments with separate stations – general orientation, master pattern and rubber mold making, wax pattern making and assembly, ceramic shell coating and dewaxing, melting and fettling. In each station, the presentation was done either through a lecture and video, or the participants were given the chance to experience the process thru hands-on activities.

To facilitate the orderly conduct of the activity, the group prepared a guide sheet to orient the participants of the presentation flow. A map was provided complete with the description of the various processes in investment casting. An important part of the guide sheet is the tour sequence in the upper right side of the guide.

The whole activity lasted for three

Mr. Eljohn Lapad and Mr. Juanito G. Mallari present the master pattern making and rubber mold making.

Mr. Jyrwen A. Ayao gives an introduction to the wax pattern making process.

A participant pours wax into a rubber mold to make a wax pattern.

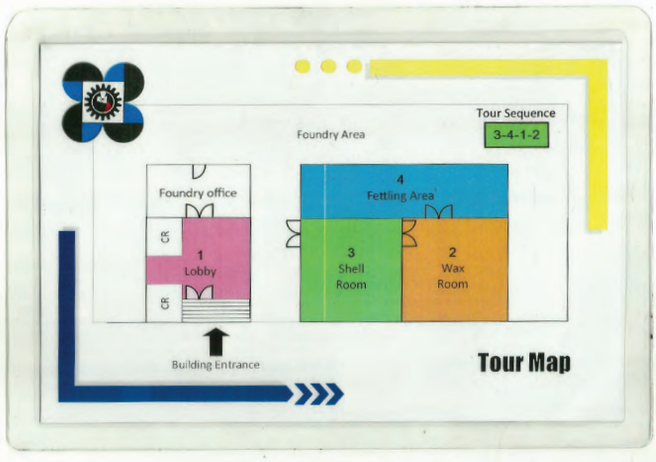
Mr. Celso L. Aguisanda gives an overview of the ceramic shell making process before the participants had a chance to experience doing the process themselves.

Ms. Jocelyn Jerusalem demonstrates the process of wax pattern assembly prior to the participants doing the assembly themselves.

Mr. Cornelio Y. Baldon and Mr. Elfred Teodosio explain the dewaxing, melting and fettling processes of investment casting.

Mr. Elfred Teodosio demonstrates an aspect of the melting and pouring process.

(3) hours and accommodated 25 participants per session. Two sessions per day were conducted – one in the morning and one in the afternoon. For the whole duration of the NSTW, a total of nine (9) sessions were conducted. For these efforts, the PRS was awarded a Certificate of Recognition for innovation in the presentation of a technology demonstration.



Front page of the tour guide containing a description of the various investment casting processes.

Technology Diffusion Division

Harnessing R&D outputs, Commercializing S&T services for a more empowered M&E industries

Research and technology outputs of the Center will simply remain outputs and serve to increase the number of the MIRDC's accomplishments for the year. The Technology Diffusion Division (TDD) exerts unswerving efforts to bring these outputs to end users – the industry, the academe, the relevant government institutes. Focused on making the industry make the most out of MIRDC-developed technologies, the TDD gives valuable contribution to the shaping of a science, technology, and innovation-oriented Philippines.

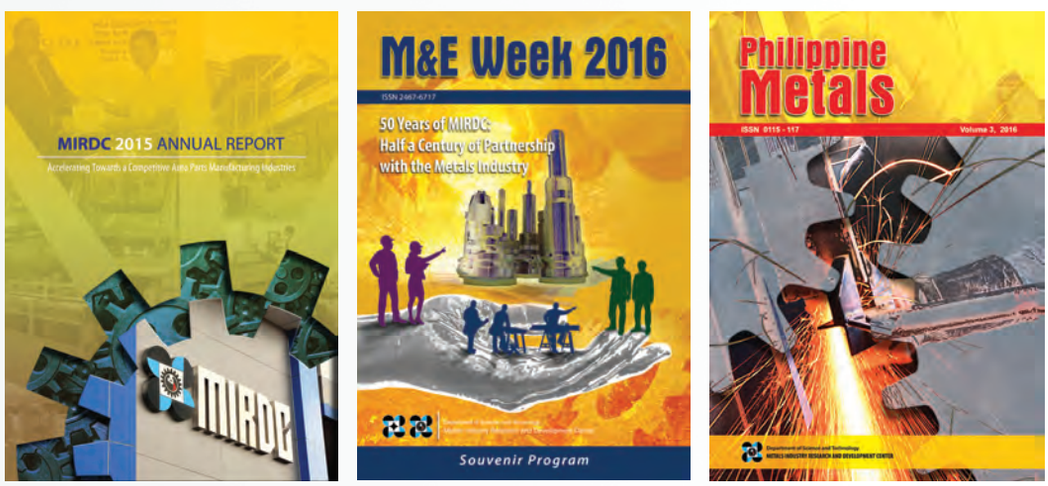
The DOST-MIRDC's Technology Diffusion Division - Technology Information and Promotion Section (TDD-TIPS) is committed to remain ever attuned to the Center's promotion requirements, and to the public's need for accessible technology information. Celebrating the DOST-MIRDC's 50th Founding Anniversary this year adds a big enough reason for the TIPS to step up and go for more feats which are sure to create the impact the Center so desires to deliver to the industry.

Production of Information, Education, and Communication (IEC) Materials

This year witnessed the release of IEC materials that gave way to effective promotions of technologies developed by the Center. Through diligent compliance to its customers' requirements, the TIPS was able to pull off its task of coming up with ways to enable the Center to reach out to the industry.

Updates of the Center's R&D initiatives, the latest on its partnerships and linkages, plus a peek into what the industry can look forward to in the future endeavors of the DOST-MIRDC were presented in the 2015 Annual Report, and the three issues of the Trends and Events released in the months of January, May, and September. The TIPS was heavily involved with coordinating with various project teams for the completion of the Philippine Metals (Phil Metals), Volume III, which highlighted the technical papers authored by the Center's very own engineers and support personnel. In addition, the TIPS produced flyers and brochures specially for technologies being featured in science fairs, exhibits, and also for facilities to be launched to the public.

The Metals and Engineering (M&E) Week Souvenir Program is another addition to the list of accomplishments of the TIPS in 2016. Inside the pages of the M&E Week



Three of the DOST-MIRDC's major publications for 2016.

The Coffee Table Book released during the celebration of the DOST-MIRDC's 50th Anniversary.

Souvenir Program are write-ups about the Center's collaborations with partner industry associations. With the rate the DOST-MIRDC is going on its project implementation, its network among organizations in the M&E industries has expanded continuously through the Makinarya at Teknolohiya para sa Bayan (MakiBayan) initiative launched in 2012.

Produced also in 2016 are four (4) video materials: Emergency Tent Video; MIRDC Anniversary Video; MIRDC Institutional Video; and a video of the National Anthem. The TIPS organized and coordinated the activities for these video productions, the outputs all aim to create materials for clear, easy, and effective technology promotion. The National Anthem video, which will be shown in programs and official gatherings, is intended to demonstrate how the MIRDC contributes to nation-building through science, technology, and innovation.

2016 is indeed a very memorable year. The TIPS undertook the production of the MIRDC 50th Anniversary Coffee Table Book. Each page in this special publication is a celebration of the 50 fruitful years of the DOST-MIRDC and its equally rewarding partnership with the M&E industries.

The Coffee Table Book was a TIPS-led initiative that is meant to elicit from the readers a sense of pride in all that was achieved for the industry, and a sense of deep commitment to work in harmony for greater benefits for the industry. As a proactive practice, the TIPS also applied for and successfully secured an International Standard Book Number (ISBN) for the Coffee Table Book to give it an identity of its own.

Promotion of MIRDC Technologies in National/Regional DOST S&T Events

Through the TIPS, the DOST-MIRDC's technologies were highlighted and actively promoted in several S&T events in 2016. It was the TIPS who organized the activities in preparation for the Center's participation in exhibitions such as: the 6th Anniversary of the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) held on 29 June 2016 at the Widus Hotel, Clarkfield, Pampanga; the Regional DOST Science and Technology Exhibits held simultaneously in DOST VII (Central Visayas) and DOST X (Cagayan De Oro) on 25 July 2016; the 2016 Power-Trends at the SMX Convention Center in Pasay, on 21-23 September 2016; and the Comptrends 2016, organized by the Leverage International (Consultants), Inc. held on 12 October 2016 at the Metrobank Building in Makati City. Showcased in the said S&T events is the DOST-MIRDC's Hybrid Road Train, designed and developed

The Hybrid Road Train (above) and the Automated Guideway Transit (below) are among the top technologies showcased during exhibitions participated in by the DOST-MIRDC.

The MIRDC Vicinity Map welcomes NSTW guests.

The TIPS was in charge of handling registration of guests during the 2016 NSTW.

by the Center's very own engineers in co-operation with partners from the private sector. The TIPS also led the Center's participation in the House of Representative's exhibition themed, 'Achieving Food Security through Science and Technology Innovations,' where technologies like the Hand Tractor-attached Transplanter and the Hand Tractor-attached Harvester were featured.

The most imposing S&T event participated in by the Center for the year was the 2016 National Science and Technology Week (NSTW) held from 25-29 July 2016. The NSTW celebration was given a never-before-done twist. In 2016, the NSTW was held simultaneously in the four major science clusters (Bicutan, Quezon City, Manila, and Los Baños), as well as in all regional offices of the DOST. It was a nationwide celebration of the critical value of science, technology, and innovation to the growth of the Philippines. Giving its full support, the DOST-MIRDC actively participated in the 2016 NSTW celebration with a string of activities to promote and disseminate information on its developed technologies, as well as on completed and ongoing projects.

The TIPS demonstrated its usual flair for fast-paced client-centered promotional activities. The week-long Open House was an opportunity for the Center to actively boost public awareness on the capabilities of its various laboratories such as the Chemical, Mechanical, and the Calibration and Metrology Laboratories. To further play up the services of the MIRDC through its enhanced R&D capabilities, the Die and Mold Solution Center, Gear Making and Assembly Facility, Metalcasting Facilities, Surface Engineering Facilities, Auto-parts Testing

Some of the facilities/technologies featured during the DOST-MIRDC Open House were: (clockwise from left) welding, die and mold, and investment casting.

DOST-MIRDC's covered walk cum gallery of completed and ongoing projects as one of the attractions during the 2016 NSTW Open House.

Solar TV interviews DOST-MIRDC Executive Director Robert O. Dizon for its 'Motoring Today' show featuring the Hybrid Road Train.

Facility (ATF), and the Finite Element Analysis (FEA) Facility also opened their doors to NSTW guests. On display at the new DOST South Gate were the Automated Guideway Transit (AGT) System and the Hybrid Road Train.Promotions for technologies like the FEA, Investment Casting, Shielded Arc Metal Welding, ATF, Non-cyanide Electroplating, Anodizing, Vacuum Gas Quench Heat Treatment, and Metals Identification were carried out through techno fora.

Pre-event preparations, invitation, overall logistics, and post-event tasks were handled by the TIPS in coordination with focal persons from each division. Although such kind of NSTW celebration was a first, the entire week proved to be the kind that roused awareness and spurred science, technology, and innovation-based activities from the government, the industry, the academe, and other stakeholders.

Media Engagement

The DOST-MIRDC recognizes the critical role of the press in shaping a nation with well-informed and intelligent decision makers, and thus continues to nurture its partnership with the media, which has grown stronger and more relevant over the years. 2016 saw the deepening of this MIRDC-media relationship as the Center, through the initiative of the TIPS, was able to harness all forms of media - print, TV, radio, and the Internet – in order to widen its reach.

The TIPS made sure that stories about the Center's technologies and services are picked up and reported by the media. All throughout 2016, the DOST-MIRDC had its fair share of exposure through media coverages, most especially about the Hybrid Road Train and the Hybrid Electric Train. These advanced transportation technologies were seen on TV, heard on the radio, read on newspapers, and were featured in online news. Other attention-catching technologies which gained nationwide press coverage were the Hand Tractor-attached Transplanter and Hand Tractor-attached Harvester, the food processing equipment, the Tikog Flattening Machine, and facilities like the Calibration Laboratory, Investment Casting Facility, and the ATF.

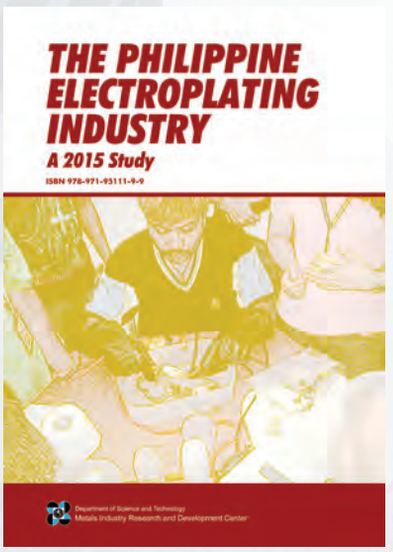
Hosts of GMA 7's 'i-Bilib' show with DOST-MIRDC's Engr. Lemuel N. Apusaga.

Mr. Ruperto C. Magno shares insights during the Consultative Dialogue with players in the electroplating industry.

Implementation of Industry Study

Two (2) industry study initiatives were carried out in 2016 with the unflagging efforts of the TIPS through its Industry Research and Studies Unit (IRSU). The IRSU has been conducting surveys, profiling, and industry studies for many years and has, up to the present, contributed to the overall success of the Center in fulfilling its mission of promoting information exchange.

The sectors in focus for 2016 were electroplating and welding. IRSU personnel in charge of conducting the surveys did so in 2015. Survey covering electroplating companies was conducted from February to October 2015, while survey on welding shops was extended until May 2016.



Questionnaires were fielded to electroplating and welding shops in identified regions nationwide. Implementation of such activities encourages open communication between the DOST-MIRDC and the metals, engineering, and allied industries. Through the IRSU staff, the Center was able to delve into the most important issues surrounding the industry.

In relation to the Electroplating Industry Study report preparation, the TIPS organized a Focus Group Discussion (FGD) with electroplating industry representatives. The FGD, held on 19 October 2016 and well attended by key players, served as an avenue for the presentation of the survey results, validation of data, and gathering further insights from the industry. It was also where the industry had the opportunity to discuss with the DOST-MIRDC the possibility of forming a new electroplating industry association. As a spin-off, a follow-up Consultative Dialogue with the electroplating industry

The TIPS facilitated the registration of guests and accommodated inquiries during the 'Kalye Share Yeah' activity along Roxas Blvd.

Executive Director Robert O. Dizon leads the unveiling ceremony of the New DOST South Gate and the MIRDC Marker.

was held on 05 December 2016. All matters discussed in the two dialogues with the industry helped solidify the content of the Electroplating Industry Study, which was completed by the end of 2016. It was released complete with an approved International Standard Book Number (ISBN). The write-up for the Welding Industry Study is currently being drafted by TIPS.

Organization of Project-related Events and Center-led Activities

As the Center's promotions arm for its services and technologies, the TIPS extends assistance to project teams and other divisions in the conduct of a wide range of activities. The Center turns to the TIPS for events-handling, which the group was able to effectively execute for the following:

a. Bayanihan sa Daan Movement-led 'Kalye Share Yeah: A Road Sharing Event' held on 07 February 2016, where the Hybrid Road Train was promoted alongside other mass transportation alternatives;

b. Metals and Engineering (M&E) Week, celebrated on 13-17 June 2016, where the TIPS gave critical contribution to the timely execution of event deliverables. The TIPS remained ever-staunch in coordinating with M&E/50th Anniversary Week committees to make sure that all activities are done in synch with one another. The M&E Week, observed in consonance with the Founding Anniversary of the DOST-MIRDC, was celebrated with the following related events:
   i. Launching of the New DOST South Gate and Unveiling of the MIRDC Marker
   ii. 1st MIRDC Skills Competition
   iii. M&E International Conference/Thanksgiving Night
   iv. MIRDC Homecoming 2016

(L) DOST Sec. Mario G. Montejo answers questions by the media aboard the Hybrid Electric Train on its Demo Ride/Launching at the Philippine National Railways' Tutuban Station; and (R) MIRDC personnel and industry partners present during the PartnerShape 2.0 crowd around and shake the hand of outgoing DOST Sec. Montejo.

(L) PDMA's Louie T. Fuster presents to program participants one of the newest equipment in the Gear Making and Assembly Facility; (R) MIRDC Executive Director Robert O. Dizon welcomes members of the S&T Committee of the House of Representatives; and (Bottom) MIRDC's Deputy Executive Director for R&D, Engr. Jonathan Q. Puerto, leads the ceremonial turn over of the Forage Chopper to the Central Luzon State University.

v. MIRDC 50th Anniversary/ Employees' Day

c. Media Demo Ride/Launching of the Hybrid Electric Train on 25 June 2016 at the Tutuban Station of the Philippine National Railways (PNR);

d. PartnerShape 2.0 held on 05 July 2016 at the Platinum Auditorium in the MIRDC Compound, where industry partners, represented by association presidents and M&E company officials, celebrated six fruitful years with the DOST under the leadership of former DOST Secretary Mario G. Montejo;

e. Launching of the Gear Making and Assembly Facility conducted on 26 July 2016 at the Platinum Building of the DOST-MIRDC;

f. Turnover Ceremonies of the Forage Chopper for Goat Production conducted on 11 August 2016 at the Central Luzon State University (CLSU), Science City of Muňoz, Nueva Ecija; and

g. Visit of the members of the Science and Technology Committee of the House of Representatives to the DOST-Bicutan cluster, where the MIRDC proudly offered a tour of the facilities as well as a demo run of the Automated Guideway Transit (AGT).

On top of all of these activities, the TIPS exhibited unwavering determination in the delivery of its usual tasks. Throughout the year, the DOST-MIRDC opens its doors to parties interested to hold plant visits and educational tours. These are usually public and private companies involved in the M&E and allied industries, and colleges and universities that cater to students taking up engineering and engineering-related courses. On its Golden Anniversary year, the DOST-MIRDC successfully accommodated 42 plant tours. Aside from these, the Center's library is open to researchers whose focus of study is the M&E and allied industries. For 2016, the Center served a total of 302 researchers: 180 from the academe; 32 from the government; and 90 from the private sector.

In 2016, the Industrial Training Section (ITS) conducted a total of 158 training programs to 4,060 participants from 666 firms and generated a total income of Php 3.3M. Tables 1-3 below present the title, frequency, and number of training participants of each training program implemented. Table 4 shows the regional distribution of training conducted by the ITS.

Table 1. Summary of Regular Training Programs Conducted in 2016

Title of Regular Training Programs	Frequency of Programs Conducted	No. of Trained Persons
Awareness on Risk Management (Based on ISO 31000:2009)	3	27
Customer Satisfaction Measurement	1	6
Developing & Implementing a Laboratory Quality Management System Based on ISO/IEC 17025	1	21
DM I: Basic Measurement	4	86
DM 2: Basic Length Calibration	3	39
Electroplating Processes	2	16
Establishment of Preventive Maintenance System	2	20
Heat Treatment of Steels	1	9
Industrial Calibration	5	124
Metals ID & Selection	1	8
Non-destructive Testing	2	15
Production Planning and Control	1	18
Productivity Improvement Through Value Analysis/Value Engineering I	1	10
Product Costing	1	6
Root Cause Analysis	1	6
Uncertainty of Measurement	2	30
Verification of Common Laboratory Instruments	1	21
TOTAL	**32**	**462**

Table 2. Summary of Packaged Training Programs Conducted in 2016

Title of Packaged Training Programs	Frequency of Programs Conducted	No. of Trained Persons
Awareness on ISO 9001:2015	2	78
Awareness on Risk Management (Based on ISO 31000:2009)	11	383
Awareness Seminar on ISO 9001:2015	10	351
Brazing Processes	2	42
Calibration of Industrial Instrument	1	24
Calibration of Weighing Scales	1	23
CNC Lathe Programming & Operation	2	29
Customer Satisfaction Measurement	1	8
DM I: Basic Measurement	2	11
Documenting a QMS Conforming to ISO 9001:2015 Standard	1	31
Electroplating Processes	2	8
Establishment of Preventive Maintenance System	1	8
Heat Treatment of Steels	3	61
Industrial Calibration	2	13
Information Seminar on ISO 9001:2015	1	41
Internal Quality Audit	3	64
ISO 9001:2008 Awareness	1	46
Length & Pressure Gauge Calibration	1	1
Machine Shop Operations (Milling & Grinding)	3	44
Reinforcing Steel Bar & Equal Leg Angle Bar	1	4
Shielded Metal Arc Welding	1	20
Technical Capability Enhancement for Local Agricultural Machinery Manufacturers (Production Planning and Control, Product Costing, Value Analysis/Value Engineering I)	1	29
The Basics of Die Design and Fabrication and the Fundamentals of Pressworking	1	5
Transition to ISO 9001:2015	1	24
Uncertainty of Measurement	1	8
TOTAL	**56**	**1356**

Table 3. Summary of Regional Training Programs Conducted in 2016

Title of Regional Training Programs	Frequency of Programs Conducted	No. of Trained Persons
Awareness on Risk Management	1	38
CNC Plasma Cutter Programming & Operation	1	19
CNC Router & CNC Plasma Cutter Programming & Operation	1	27
CNC Router Programming & Operation	1	20
Corrosion Management	1	9
Die Design and Die Making, Mold Design and Mold Making (D2M2) Training	1	26
Electroplating Processes	1	18
Heat Treatment of Steels	1	25
Information Seminar on Facts about Welding Oxygen Cylinder	1	105
Information Seminar on Fuel Cylinders in Welding	1	105
Information Seminar on Metals ID & Selection	1	43
Information Seminar on Productivity Improvement through 5S Practice	4	252
Information Seminar on Anodizing Technology	1	21
Information Seminar on Auto Parts Facility	1	67
Information Seminar on Computed Radiography	1	23
Information Seminar on Effective Presentation Skills	2	47
Information Seminar on General Welding Processes	1	56
Information Seminar on Metal Fabrication	1	10
Information Seminar on Metals Identification	1	56
Information Seminar on Metals Technology & Processes	1	14
Information Seminar on Non-Cyanide Electroplating	1	97
Information Seminar on Shielded Metal Arc Welding	3	69
Information Seminar on Tungsten Inert Gas (TIG) Welding	1	11
Information Seminar on Vacuum Gas Quench Heat Treatment Furnace	1	103
Information Seminar on NX	1	7
Information Seminar on Production Planning and Control	1	21
Information Seminar on Welding Processes	1	5
Internal Quality Audit Based on ISO/IEC 17025	2	63
Investment Casting (Presentation of Technology)	9	241
ISO 9001:2015 Orientation	1	44
Machine Shop Operations	2	79
Metal Fabrication through Wrought Iron Forming	2	67
Metals Testing	1	18
Occupational Health & Safety	4	94
Overview on Finite Element Analysis w/ Open Forum	1	49
Production Planning and Control	3	53
Productivity Improvement through 5S Practice	4	97
Product Costing	1	27
Tungsten Inert Gas (TIG) Welding on Carbon Steel Plates	1	15
Tungsten Inert Gas (TIG) / Metal Inert Gas (MIG) Welding	1	21
Value Analysis / Value Engineering I	1	30
Wrought Iron Forming	2	28
Wrought Iron Forming & Blending	2	22
TOTAL	**70**	**2242**

Table 4. Regional Distribution of Training Programs Conducted

TRAINING PROGRAMS	NUMBER OF PROGRAMS IN THE REGIONS																
	NCR	CAR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	CARAGA	ARMM	TOTAL
Metal Casting Technology	9																9
Metalworking Technology	27		1		2	8				3			3		4		48
Analysis & Testing	31							1									32
Engineering, Production & Planning	6				1					3			1				11
Management/Productivity Improvement	1				1												2
Trainer's Training	2																2
Others	34			1	3	8		2					3			3	54
TOTAL	**110**	**0**	**1**	**1**	**7**	**16**	**0**	**3**	**0**	**6**	**0**	**0**	**7**	**0**	**4**	**3**	**158**

Below are some of the training programs conducted by the ITS for different institutions in various regions in the country:

Value Analysis/Value Engineering I (VA/VE I)

The VA/VE I Seminar/Workshop was conducted for project leaders and staff engaged in R&D programs funded by the DOST-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD). This was held on 29 June – 01 July 2016 at the Central Luzon State University (CLSU), Science City of Muňoz, Nueva Ecija.

Technical Capability Enhancement for Local Agricultural Machinery Manufacturers

The DOST-MIRDC, in collaboration with the Philippine Center for Postharvest Development and Mechanization (PHilMech), conducted three (3) training programs, namely: Production Planning and Control, Product Costing, and Value Analysis/ Value Engineering I under the Technical Capabil-

Value Analysis/Value Engineering I. Resource Speaker, Engr. Francisco C. Dime, explains the concept of VA/VE I.

Product Costing & Production Planning & Control participants pose together with resource speakers Engr. Adonis T. Marquez and Ms. Eunice A. Bautista.

Participants of Value Analysis/Value Engineering I discuss the assigned hands-on exercises.

Product Costing. Participants work on their assigned exercises.


(L) Uncertainty of Measurement. Resource Speaker, Mr. Eduardo V. Diasanta, Jr., (R) Industrial Calibration. Resource Speaker, Engr. Paul Danniel Aquino, during the lecture/discussion with Drake Marketing and Equipment Corporation's participants.


(L) Customer Satisfaction Measurement Resource speaker, Ms. Jaquelin J. Agonoy, explains the CSM concept, and (R) Resource speaker, Engr. Melchor A. Gamilla, explains the Establishment of Preventive Maintenance System.

ity Enhancement for Local Agricultural Machinery Manufacturers Project to upgrade the technical knowledge and capability of the local agri-machinery manufacturers licensed by the PHilMech. The training programs were attended by 28 participants coming from 14 fabricators, licensing technology, and government institutions. These were held at the PHilMech, Science City of Muñoz, Nueva Ecija.

Uncertainty of Measurement, Industrial Calibration, Customer Satisfaction Measurement, and Establishment of Preventive Maintenance

The DOST-MIRDC, in response to a request made by the Drake Marketing and Equipment Corporation, conducted the four training programs on 12-13 April 2016, 29-30 April 2016, 26-27 September 2016, and 28-30 June 2016, respectively. All the four training programs are intended to help the company address particular needs in preparation for their application for ISO 17025 accreditation.

Productivity Improvement through 5S Practice

Engr. Reynaldo L. Dela Cruz and Ms. Jocelyn Dime of the TDD-ITS conducted a seminar/workshop on Productivity Improvement through 5S Practice on 31 May 2016 at Tagum Inn, Tagum City, Davao del Norte. The training program was attended by 35 participants from the industry, academe, DOST, and association in the whole province of Davao del Norte.

Occupational Health and Safety

On June 01, 2016, another seminar/workshop was conducted with 39 participants in attendance coming from six (6) firms from the province of Davao del Norte.

(L) Ms. Jocelyn Dime facilitates the training on Productivity Improvement through 5S; (center) Engr. Reynaldo L. Dela Cruz, Jr. (seated, rightmost) joins the training participants for a group photo; and (R) Engr. Reynaldo L. Dela Cruz Jr. conducts the Occupational Health and Safety Seminar.

The activity was held at Tagum Inn, Tagum City, with Reynaldo L. Dela Cruz, Jr. of TDD-ITS as resource speaker.

Heat Treatment of Steels and Brazing Processes

A seminar/workshop on Heat Treatment of Steels and Brazing Processes, in coordination with the Technical Education and Skills Development Authority (TESDA), was conducted on 19-23 September 2016 with the objective of enhancing the skills and capability of TESDA trainers from different regions.

Engr. Dela Cruz shows the proper way to ignite and adjust a brazing flame.

(L) Engr. Reynaldo L. Dela Cruz Jr. demonstrates proper handling and set-up of cylinders, (R) A Brazing Processes participant performs actual brazing on copper tubings.

IMPACT ASSESSMENT

The ITS conducts impact assessment survey to evaluate the impact and benefits of the training programs to the participants and to the organization. This helps the Center identify the future needs of the industry, and determine ways to continually improve training program offerings. The survey is administered six months after the conduct of a training program.

Table 5 presents the survey results from 282 respondent-firms. The survey was conducted from January-December 2016.

Table 5. Results of impact assessment survey conducted in 2016

IMPACT/BENEFITS	TOTAL	%
Enhanced Employees' KSA	636	39.14%
Reduced Costs	98	6.03%
Increased Production/Sales	76	4.68%
Diversified Products	45	2.77%
Others	107	6.58%
Established New Business	14	0.86%
Conformed to Standards	175	10.77%
Transferred K & S	418	25.72%
Promoted Employees	56	3.45%
Total	**1625**	100.00%

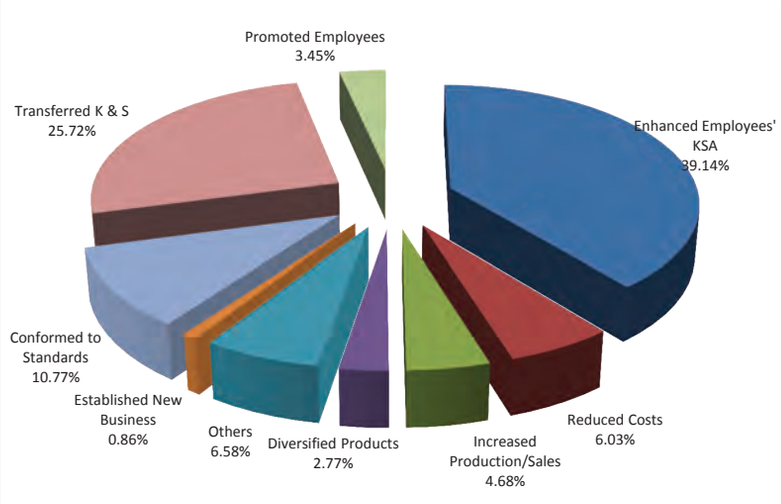


Figure 1. Distribution of training impact/benefits based on impact assessment survey

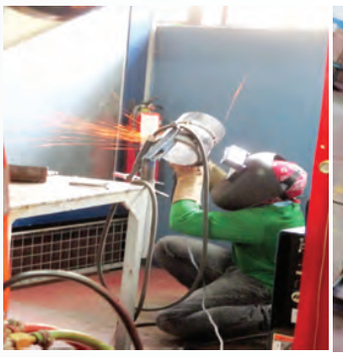
M&E Skills Competition

The ITS led the conduct of the 1st Metals and Engineering (M&E) Skills Olympics with the leadership of Engr. Reynaldo L. Dela Cruz, Jr., Chairman of the Sub-committee on Skills Competition, which is one of the activities lined up for the celebration of the M&E Week and 50thFoundingAnniversary of the MIRDC. This trade skills competition is in cooperation with MIRDC's partner industry associations that extended untiring support to the M&E industries: the Metalworking Industries Association of the Philippines (MIAP); the Philippine Die and Mold Association, Inc. (PDMA); the Philippine Welding Society (PWS); and the Mechatronics and Robotics Society of the Philippines (MRSP).

The competition featured four (4) trade skills, namely: Mechanical Drafting using Solidworks; Machining- Turning/Milling NC II; Bench Work NC I; Shielded Metal Arc Welding (SMAW) NC I and NC II and Mechatronics and Robotics; the events were held as early as two weeks prior to the M&E Week celebration. Each organization effectively handled their skills competition based on established rules and guidelines. Competitors coming from private companies and academe who participated in this important event performed with confidence as they demonstrated prowess in their field of specialization. Prizes at stake were cash, equipment, and certificates and trophies for champions and runner-ups.

Mechatronics and robotics competition held on 04 June 2016.






Leftmost: Dir. Fernando M. Opeda of the Philippine Welding Society (PWS) discusses the mechanics of the competition to the contestants for the contest proper (SMAW NC I, held on 07 June 2016 and SMAW NC II, held on 08 June 2016).




TNA conducted on May 31, 2016 in Tagum City organized by the PSTO - Davao del Norte and participated by the different firms, school, and industry association, particularly SETUP proponents in the province. A list of training programs was identified by the 20 companies/entities.

The awarding ceremony, coinciding with the celebration of MIRDC's 50th Anniversary week, was held on 14 June 2016 at the MIRDC's Platinum Auditorium.

TRAINING NEEDS ASSESSMENT

Training Needs Assessment (TNA) activities were conducted to obtain information on the needs of the company with respect to training. The TNA is also an activity that helps the ITS personnel in setting priorities and planning activities to obtain support from local government, among others. It is also important to state-level agencies or organizations as they are among the top users of information about needs, service gaps, and systems issues across the state. Conduct of TNA-related activities brought the ITS personnel to various regions.

REGION XI

Reynaldo L. Dela Cruz Jr., Jocelyn F. Dime and Jaquelin J. Agonoy of the ITS conducted TNA in Davao City. The team accomplished the following:

a. Identification of the region's training needs through a meeting with the Metal-working Industries As-

The TNA team visits Rainbow J & N Steel Body Making & Repair Shop.

The TNA team conducts an assessment of Sumatra Auto Repair and Body Building Shop.

The TNA team administers the activity at Ronald Manzano Motor Repair Shop.

sociation of the Philippines - Davao Chapter (MIAP-Davao), the Provincial Science and Technology Offices (PSTOs) and Regional Officers of DOST XI;

b. Assessment of the training needs of Tagum City, Davao del Norte through a consultative meeting with different firms, the academe and relevant industry association; and

c. Discussion of possible conduct of training program in Nabunturan, Compostela Valley through a meeting with firms in the metals sector, DOLE XI-GIP, and the PSTO. The ITS team also visited some metalworking firms.

REGION IV (MIMAROPA)

The ITS was able to conduct TNA on 28 April 2016 at the Romblon State University in Odiongan, Romblon. The team was also at the Poc-Toy Auto Care Center in Alcantara, Romblon for the conduct of the Occupational Safety and 5S seminars.

TDD-TABDS Chief Engr. Girlie M. Millo (second from left) poses with fellow MIRDC personnel.

MIRDC Staff explains one of the featured technologies during the Technology Transfer Day in Davao City.

An exhibit viewer listens to MIRDC technical staff Engr. Joseph Alfred V. Garcia during the Technology Transfer Day in Ormoc City.

Technology Transfer

The Technology Advisory and Business Development Section (TABDS) conducts technology transfer to disseminate the Center's research and development (R&D) results and other metal sector-related technologies to industry and other interested parties through the conduct of technical consultancies and training including information dissemination and promotional activities.

The major highlights on technology transfer activities during the year in review is the Center's participation to the DOST Technology Transfer Day held in Sofitel Philippine Plaza Manila, Ormoc Superdome in Ormoc City, and SMX Convention Center in Davao City, last 27 April 2016, 14 September 2016 and 13 December 2016, respectively. The event was spearheaded by the Technology Application and Promotion Institute (TAPI) through the coordination of the various DOST Councils, Regional Offices and Research and Development Institutes.

During the activity, 72 technologies were featured, six (6) of which were developed by the MIRDC, namely: Hand Tractor Attachment for Transplanter, Hydroseeder, Food Innovation Center Processing Equipment, Automated Guideway Transit (AGT) Systems, Hybrid Electric Road Train and Super Lilok. The Technology Transfer Day's program segment Technology Showcase also allowed researchers, technology generators and technology licensing officers (TLO) to present the features, investment opportunities and commercialization plan of their technologies to various individual business firms, investors and venture capitalists who might be interested to bring the research outputs to the market. As a result of the activities, a total of 20 term sheets were signed by various interested equipment fabricators. The term sheet corresponds to an intent to license the technology and serves as an initial agreement between MIRDC and the interested firm on the fees and conditions set by said parties.

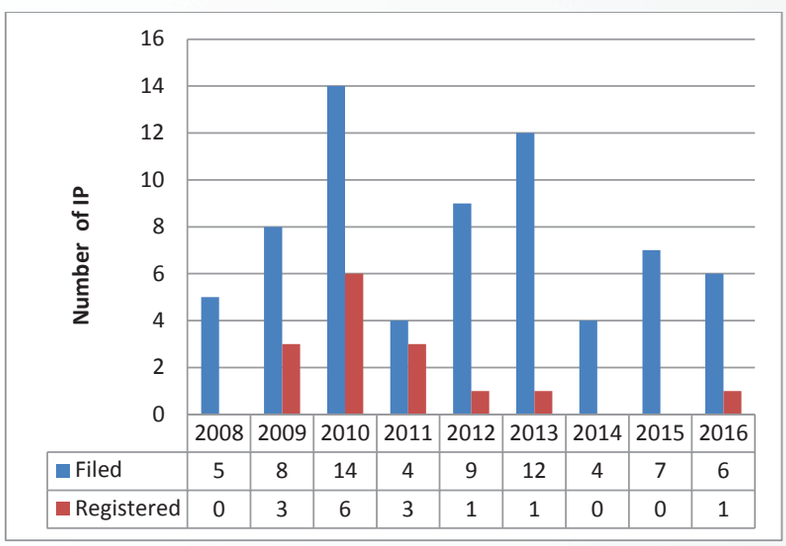
Intellectual Property (IP) Management

As the country pushes towards the increasing knowledge-driven economy, the MIRDC acknowledges the importance of effective Intellectual Property (IP) Management through the implementation of the DOST IP Policy (DOST Administrative Order No. 004). The Technology Advisory and Business Development Section, which also functions as the Technology Licensing Office of the Center, continued to enhance its assistance and guid-

Title of IP Filed	TYPE	Researchers
Superheated Steam Treatment Machine for Brown Rice	Invention	Dominic S. Guevarra Joein L. Luces
Transplanter Attachment for Hand Tractor	Utility Model	Isidro D. Millo Ronie S. Alamon Emerito V. Banal Raymond S. De Ocampo Laureano L. Dalay
Road Train	Industrial Design	MIRDC
Eyeleting-Machine Hopper	Utility Model	Francisco C. Dime Joein L. Luces Jonathan Q. Puerto Fred P. Liza Allan John S. Limson
Tikog Press Machine	Utility Model	Joein L. Luces Allan John S. Limson Fred P. Liza Francisco C. Dime Jonathan Q. Puerto
Hybrid Electric Train	Industrial Design	MIRDC

Title of IP Registered	TYPE	Registry No.	Researchers
Compact Rice Mill Diverting Chute	Utility Model	2-2014-000738	Nico Deus O. Villafranca Joein L. Luces Reynaldo P. Gregorio (PhilMECH)

Table 1: MIRDC IP Filed vs. Registered



ance to increase the number of IP of the Center, be it an invention, utility model, trademark, or innovation in processing.

In 2016, 6 IP applications were assisted by TABDS/TLO through the intervention of TAPI and another one (1) received approval as registered IP.

Technical Consultancy

A total of 362 technical consultancy services rendered to 272 individuals, organizations and offices was provided by the Center's technical experts, mainly through its Technology Advisory and Business Development Section (TABDS).

The consultancy services conducted nationwide addressed their concerns on heat treatment, electroplating, welding, fabrication, metalcasting, metalworking processes, testing and analysis, calibration and coco-coir technology, among others.

Engr. Adonis T. Marquez conducts consultancy for Choy's Welding Shop in Gumaca, Quezon.

Technology Needs Assessment (TNA) Consultancy Under SETUP (DOST-NCR)

New CMP Industrial Builders, Inc., Valenzuela City (May 4, 2016)

Structural design and fabrication of refrigerated container van

Stainless steel rack for refrigerated van

Asian Engine Rebuilders, Inc., Caloocan City (June 8, 2016)

Company's machine shop and engines rebuilding facility.

Discussion with Mr. Antonio H. Co, company owner, for possible DOST-NCR/MIRDC technology intervention in terms of productivity, capacity, and capability.

Agno Metal Trade, Caloocan City (July 7, 2016)

Mr. Emil De Leon, company owner, talks about the hydraulic press bender thru DOST-SETUP intervention.

Fabricated stainless water tank

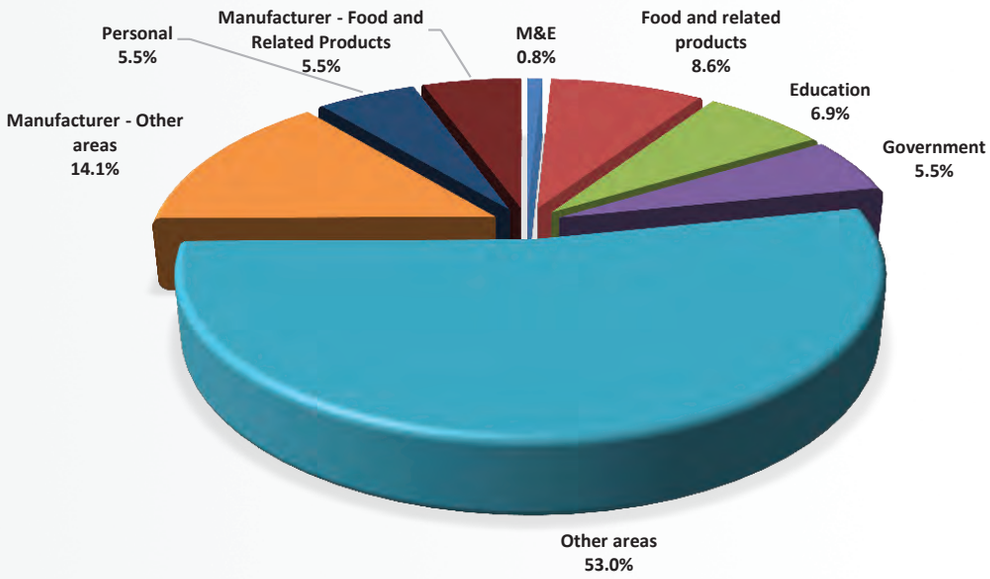
Stainless steel glass fixture

Production area for welding and metal fabrication.

EG Energy, Valenzuela City (August 11, 2016)

Switch gear electrical (fixtures) component parts

Electrical control panel board



Sectors Served

The breakdown of the sectors served through technical consultancy are shown in the pie chart.

Consultancy on the Establishment and Maintenance of a Quality Management System (QMS) Based on ISO 9001:2008 Standard

The Technology Advisory and Business Development Section provided consultancy services on the Establishment and Maintenance of a Quality Management System (QMS) based on ISO 9001:2008 Standard to various companies.

K.E.A. Industrial Corp.
Bacoor, Cavite City

The K.E.A. Industrial Corp. submitted itself in March 2016 to TUV-Rheinland for the re-certification of its Quality Management System (QMS) based on ISO 9001:2008 standard.

The company requested the support of MIRDC for KEA's staff to be more confident and be guided during the audit to ensure successfully passing the re-certification. No nonconformity was seen by the TUV-Rheinland auditors.

Total Deionization Solutions, Inc. (TDS)
Bldg. 11, Don Onofre Industrial Village, Brgy. Banay-Banay, Cabuyao, Laguna

The Metals Industry Research and Development Center (MIRDC) has been a partner of the Total Deionization Solutions, Inc. in Cabuyao, Laguna in their quest to pass the surveillance audit and maintain its certification to ISO 9001:2008 standard.

Technical Consultancy assistance on ISO 9001:2008 was provided to TDS last April 2016. A review on the established Quality Manual and six (6) mandatory procedures and re-orientation to all the staff on the proper implementation of the requirements of ISO 9001:2008 were conducted. Likewise, several recommendations for the improvement of the TDS Quality Management System particularly on the implementation of the Control of Documents and Control of Records procedures were given through a formal report.

And, prior to the conduct of the surveillance audit on April 19, 2016 by SGS Philippines, Ms. Linda G. Rivera of TDD-TABDS facilitated the conduct of their Internal Audit and guided them in the proper identification of clauses and statement of findings (both observations and nonconformities).

R.U. Foundry and Machine Shop Corp. (RUFMSC)
Sitio Aning, Brgy. Pahanocoy, Bacolod City, Negros Occidental

Engr. Mervin B. Gorospe and Ms. Linda G. Rivera conducted technical assistance on ISO 9001:2008 last March 30 to April 2, 2016 and April 13 to 19, 2016 in preparation for the last surveillance audit of the Quality Management System of RUFMSC. Likewise, an orientation on the changes of the requirements of ISO 9001:2008 versus ISO 9001:2015 was held after the audit.

Some of the highlights of activities during the consultancy visits were: (a) the review and corrections on the responses on the NCARs, and verification of the effectiveness of implementation of the corrective actions identified; (b) a one-day lecture on Root Cause Analysis using 5Whys was conducted; (c) guidance during the conduct of Management Review; (d) provided guidance and served as guide during the conduct of surveillance audit; and (e) a lecture on melting of metals for the foundry personnel. Result of the audit turns out very satisfactory with minimal observations and zero nonconformity.

Aurochs Aerospace Precision Manufacturing Corporation
Baguio City Export Processing Economic Zone, Baguio City

With the track record of the DOST-MIRDC in maintaining its ISO 9001 certification for the past 10 years, and in providing assistance to various firms under the metals and engineering industries, and to other government agencies which successfully acquired ISO 9001 certification, the AAPMC requested for the DOST-MIRDC's assistance for the certification of its Quality Management System (QMS) to ISO 9001:2008 Standard.

The journey began on 22 April 2016 when a team from the DOST-MIRDC, led by Prototyping Division Chief, Engr. Fred P. Liza, conducted an assessment of the existing management system of the AAPMC. The company was able to develop two (2) online systems to implement a paperless QMS and Production Management System (PMS). AAPMC's Mr. Kenneth Go and Mr. Jerrison Tiong discussed the features of both software. The documentation of the quality manual, quality policy, and mandatory procedures were incorporated into the QMS. The key feature of the PMS, on the other hand, is the electronic monitoring of the status of orders, starting from the receipt of the order up to final inspection. These systems are continually improved so that information gathered are used in the decision-making and action planning process of the management.

Several relevant activities followed in May and June 2016. The MIRDC Team was once again focused on giving assistance to the AAPMC through the conduct of an ISO 9001:2008 re-orientation seminar, which aimed to refresh the company's staff on the requirements of the Standard; the conduct of Internal Quality Audit (IQA) seminar, which was a way of familiarizing the AAPMC's staff on the preparation, implementation, and report writing as part of the internal audit process; and a series of technical consultancy activities, which aim to prepare and assess the readiness of the company's QMS for certification.

In June 22-23, 2016, the AAPMC conducted the actual internal audit of its QMS. This was outsourced by the AAPMC to the MIRDC. This was done in order for the AAPMC to meet its target date of certification.

Finally, the AAPMC received its ISO 9001:2008 Standard Certification on July 4, 2016. It proved to be a successful journey with minimal observations and zero nonconformity.

Science Education Institute (SEI)
DOST Compound, Bicutan, Taguig City

To ensure consistent delivery of services – provision of scholarship programs, promotions of Science & Technology programs, etc., the Science Education Institute pursued its journey for the successful certification of its management system according to the requirements of ISO 9001:2008 standard.

With the technical assistance of the MIRDC's consultants on ISO 9001, the SEI is the very first agency of the Department of Science and Technology (DOST) which implemented a less paper system in the control of documents.

The Quality Management System of SEI was assessed by the auditors of TUV-Rheinland during the Stage 1 and Stage 2 audits in September 2016 and on October 28 & 29, 2016, respectively. Some of the positive points that were highlighted by the auditors during the audit were the strong commitment of SEI's Director and the very visible implementation of good housekeeping in all the areas of the institute. It was indeed a successful journey when the lead auditor announced that there is zero nonconformity and SEI is recommended for certification to ISO 9001:2008.

On-Going Technical Consultancy on ISO 9001:2008

Dr. Danilo N. Pilar and Engr. Mervin B. Gorospe continuously review and provide recommendations in the preparation of the required documents to comply with the requirements of ISO 9001:2008 to the following government agencies:

a. Philippine Center for Postharvest Development and Mechanization (PHilMech)
b. National Commission on Indigenous Peoples (NCIP - Main)

Meanwhile, MIRDC also started to give consultancy to NW Steel Technologies, Inc. in Pulilan, Bulacan. This includes gap analysis, evaluation of the documentation and records and an awareness seminar on ISO 9001:2008.

Technical Consultancy on ISO 9001:2015

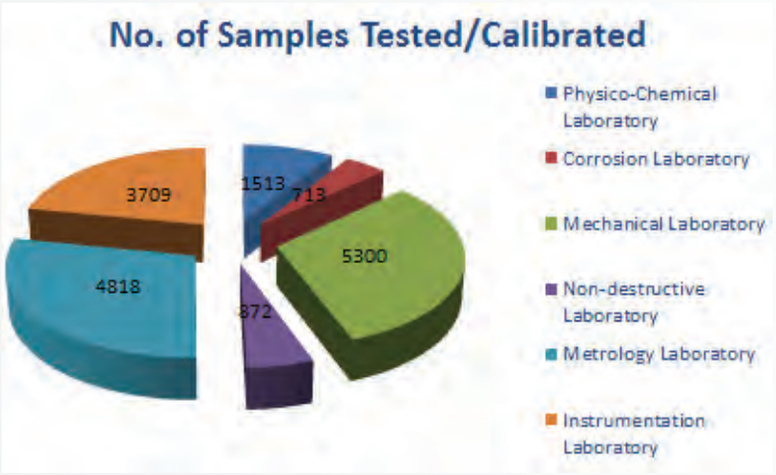
The Food and Nutrition Research Institute (FNRI) and the Department of Science and Technology – Regional Office No. 3 requested the assistance of MIRDC for the transition of its Quality Management System from ISO 9001:2008 to ISO 9001:2015.

On the other hand, the National Academy of Science & Technology (NAST) made an initial attempt to establish a Quality Management System according to the requirements of ISO 9001:2015 with Dr. Danilo N. Pilar as consultant.

Analysis and Testing Division

Exceptional Testing and Calibration Services

As the Center's flagship in material testing, the Analysis and Testing Division once again wrapped up another year with an exceptional performance. By December 2016, the division reached an astounding 128% accomplishment rate versus their annual target. It has also played huge roles in the implementation of government projects designed to ensure the use of high quality metal products. The team is delighted to present its remarkable feats this year.



A number of government projects have utilized the broad line of services offered by the division. One of which is the Office of the Civil Defense's (OCD) public bidding on kitchen wares for the disaster evacuation centers. Recognized for excellence, the division was selected as authorized laboratory for material testing of cooking pots, frying pans, ladles and the like and required their issued certificate as a prerequisite to bidding participation.

Also, on the second quarter of 2016, the Bureau of Product Standards (BPS) revised its sampling requirement for Product Standards (PS) Licensing and Import Commodity Clearance (ICC) Certification. From one set per sample grade, the new guidelines required 3 sets per sample grade for testing - tripling the required number of samples for analysis in the Chemical Laboratories Section and Physical Laboratories Section.

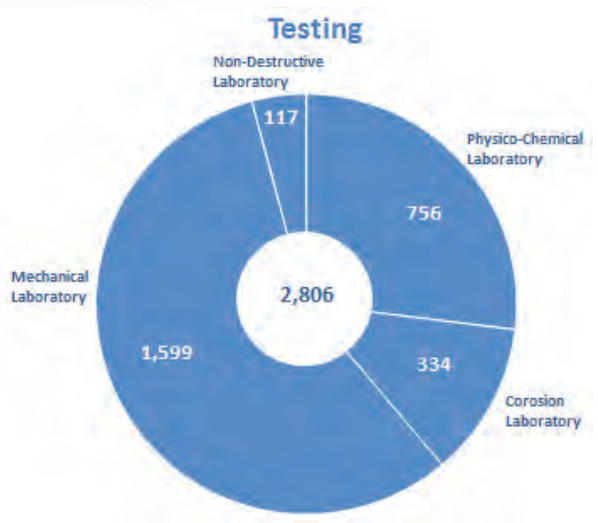
The increased demand was taken by the division as a challenge and an opportunity for service. Their dedication led to the completion of 16,925 jobs which is tantamount to 117% accomplishment rate against annual target.

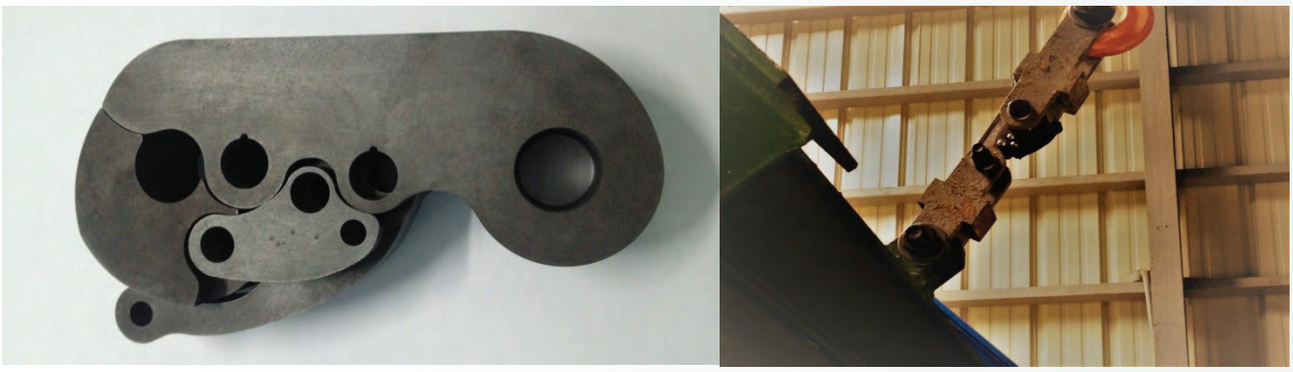
Physical Laboratories Section (PLS)

Mechanical Metallurgical Laboratory

The Mechanical Laboratory Section (MML) has retained its record of high performance by completing 1,599 jobs giving them 160% accomplishment rate.

One of their remarkable services is their assistance in the investigation of an LPG depot fire incident in Calaca, Batangas. Analysis results on the ruptured LPG tank samples sent for testing was instrumental on the rehabilitation of the said depot.





Quick release mechanism designed by Engr. Charles Edward L. Alviar

MML has also provided test services for the rail specimen maintenance of major road infrastructures like DOTR EDSA MRT-3 and Skyway as well as for shipyard industries such as the Norwegian Maritime Foundation of the Phils., Inc, Mactan Shipyard, Gensan Shipyard and Machine Works, Inc., and SAS Shipyard, Inc. to name a few.

The section is not only after providing the best service. It is also committed to encourage students to excel in science and technology through their assistance in investigatory projects. One project worth noting is the E'bloller, a cylinder liner puller assembly presented by a student from Bansud National High School. This project is expected to create a universal special service for engine block liner extraction.

Auto-Parts Testing Facility (ATF)

The ATF was established to address the growing challenges on product innovation and quality assurance in the local automotive industry. This year, the PLS group initiated the design and fabrication of the quick release mechanism and lifting system of pendulum of the Transport Body Impact Tester. Designed by Engr. Charles Edward L. Alviar, it is capable of lifting a maximum working load of 5 tons. This vital part of the Transport Body Impact Tester is used to lift and at the same time release the impactor at different heights. It is coupled to the impactor and lifting chain using adaptors as shown above. The facility was also showcased to various stakeholders like the Aerospace Industries Association of the Philippines (AIAP), the Motorcycle Development Program Participants Association (MDPPA), the San Miguel Yamamura, the TUV Rheinland, and lastly, to academe.

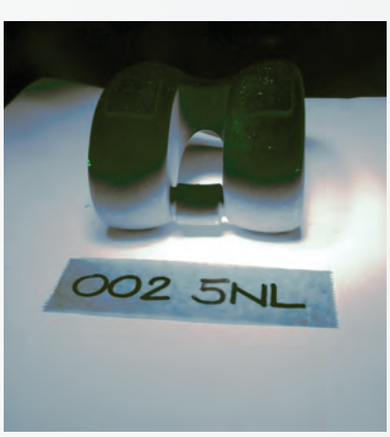
On the other hand, for the Tire Endurance Tester, the installation of the cooling tower has been completed. This will ensure the constant temperature of the hydraulic fluid which maintains the amount of force applied to the sample tires. With this development, longer time or overnight endurance test can be conducted up to the point where the tire fails.

Non-Destructive Testing (NDT) Laboratory

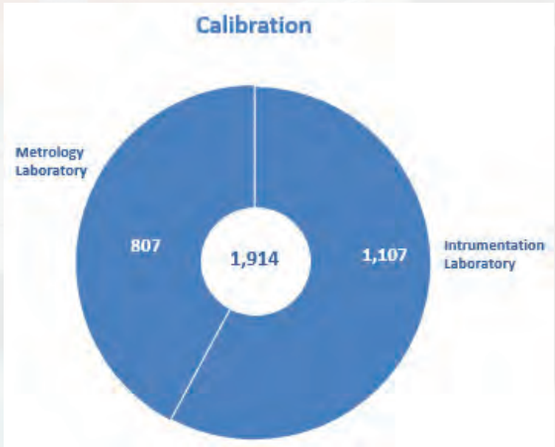
As a highly valuable technique in product evaluation, the NDT laboratory's services were sought by companies from various industries. One of their highlighted services is the surface inspection on Axis Femur Castings for knee cap per request of the Orthopaedic International, Inc. This innovation aims to provide better clinical outcomes for orthopedic patients.

NDT also assisted the Arms Corporation of the Philippines in conducting brass case/barrel testing to ensure high quality bullets prior to distribution in the market. This is on top of the regular inspection services provided by the laboratory for PNP-DRD in the acquisition of firearms.

For their internal clients, the group has also been supportive to the programs of the Advance Transportation Group through their testing services on the Bogie Assembly and Chassis, Swivel Assembly, and Mounting Base Assembly of Trainset project. The Road Train project particularly the Light CRT also



Surface inspection of the Axis Femur Casting.



The division completed 1, 914 job orders for calibration services or 106% accomplishment rate.

availed the services of the NDT laboratory for inspection of critical welds on the structure of each coaches.

New Philippine Accreditation Bureau (PAB) signatories were also accredited in NDT, namely; Engr. Arvin Y. Pacia for magnetic particle testing, liquid penetrant testing, and radiographic testing and Engr. James Asher B. Cabarloc for ultrasonic testing.

Chemical Laboratories Section (CLS)

In 2016, CLS proved again its competency when the demand for material testing samples increased. Testing for samples like angle bars, steel bars, galvanized wires, and pre-painted galvanized sheets tripled in number. Samples for non-destructive chemical testing through X-ray Fluorescence (XRF) contributed also to the accomplishment of the whole section. Overall, the section was able to serve 1,090 jobs.

Through the acquisition of XRF, the on-site testing service of the PCL was revived. Among the companies served through on-site testing are the following: STEAG State Power, Inc., Unilever Philippines, Inc., GDM Constructor, and Pinagpala Pt Aggregate Corporation.

The capability of the XRF to analyze precious metals has also contributed to the increase of jobs on one-day testing. Not only that, OCD's request for material identification on various cookwares prior to public bidding added up to the volume of samples received.

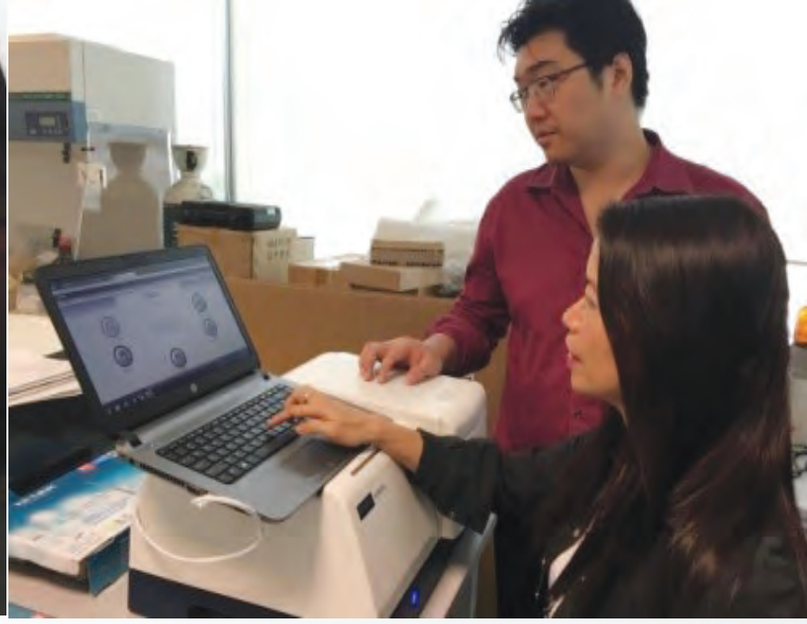
Overall, PCL received 258 samples or 145 jobs for XRF Analysis, 16 jobs on one-day testing and 4 jobs on on-site testing.

With the overwhelming increase in demand, the CLS took the initiative to work on shifting schedule to cope up with it and meet set deadlines particularly for the BPS samples.

The Corrosion Laboratory (COR), on the other hand, continued to deliver quality testing services to different steel manufacturing companies catering on samples like pre-painted roofing sheets, galvanized sheets, and galvanized wires. It also assisted TIMEX PHILIPPINES through the conduct of corrosion resistance tests on their Watch Face dial samples.

Instrumentation and Metrology Section (IMS)

In 2016, the Instrumentation and Metrology Section (IMS) was able to serve a total of 1,914 jobs for 818 different companies. Targets were still achieved despite the temporary shutdown of some scope of the Metrology Laboratory due to the building renovation, requiring the laboratory to permanently transfer from Titanium building to the Gold building of MIRDC. This year, aside from giving technical services to private M&E industries, IMS was able to provide valuable services to various government agencies, colleges and universities.

Ms. Mary Joy Bautista (L) and Ms. Maria Luisa Fajarda (R) during their training of UH5300 in Singapore.

IMS performed the following notable jobs: calibration of 150 units of weighing scale for the National Nutrition Council, and the dimensional inspection of assorted kitchen wares (cooking pot, frying pans, ladles, spoons, and forks) of different companies that submitted their bid as supplier to the OCD. The Metrology Laboratory was also commissioned by Bureau Veritas to conduct dimensional inspection of the rails of the Light Rail Transit (LRT). Another government agency that availed the service of the Metrology Laboratory is the Land Transportation Office wherein the urgently needed motor vehicle plates were dimensionally inspected.

Due to the new directive of the Commission of Higher Education that requires all school laboratories should have their instruments calibrated, different universities such as FEATI University and University of Santo Tomas approached IMS laboratories to seek help for the calibration services they need. They brought for calibration various instruments being used by students in their classes like balances, multimeters, steel rules, and calipers. An on-site evaluation visit to the University of Perpetual Help System Dalta in Las Piñas City was also conducted to check if their Universal Testing Machine can be calibrated.

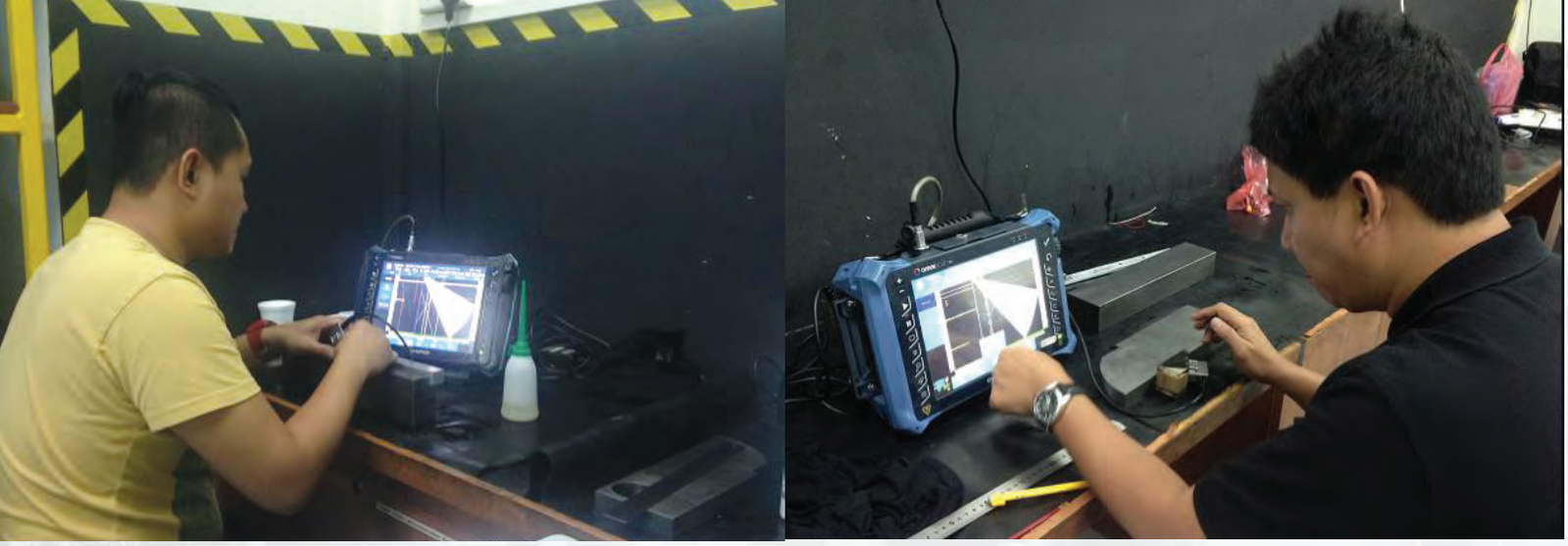
Upgrades on Testing Facilities

UV-VIS Spectrophotometer

To ensure that the customer's demand for quality and on-time results are always met, the Chemical Laboratory Section acquired a new UV-VIS Spectrophotometer, Hitachi's UH 5300 – a double beam optical system spectrophotometer. Compared with the old single beam UV-VIS spectrometer, its double beam optical system feature ensures extended periods of data stability. It uses a long life pulsed Xenon Lamp offering reliability and low operational cost as it reduces the frequency of lamp replacement. It can also accommodate several samples in a single run through its 6-cell sample compartment.

In line with this upgrade, and believing that the workforce is the division's best asset, two of the division's competent person-

Hitachi UH-5300 UV-Vis Spectrophotometer (used for the analysis of Phosphorus and Molybdenum)

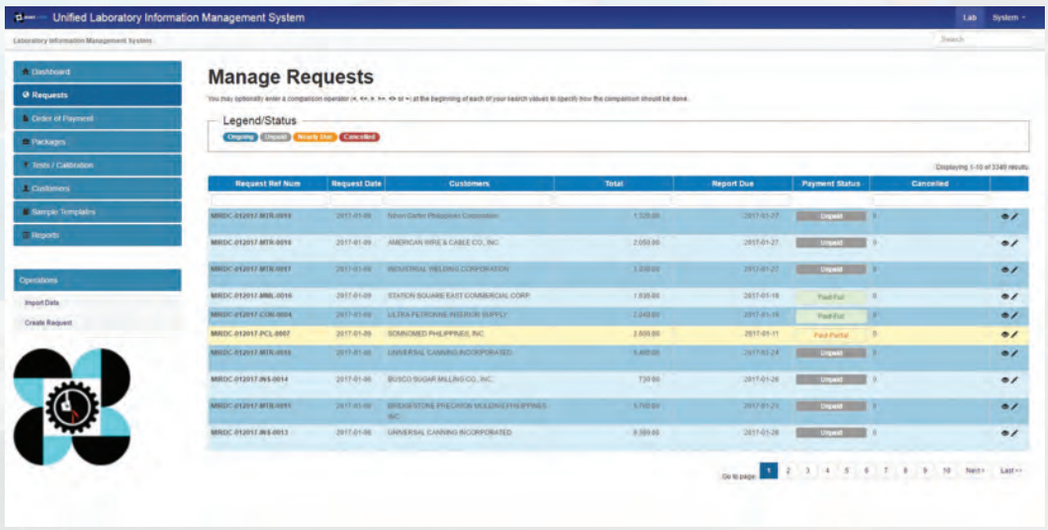


Engr. James Asher B. Cabarloc (L) and Engr. Florante A. Catalan (R) during their practical training on Phase Array Ultrasonic Testing.

nel, Maria Luisa Fajarda and Mary Joy Bautista, underwent training on the basic operation and maintenance of the said equipment in Techcomp Singapore.

Phase Array Ultrasonic Testing

Engr. Florante A. Catalan and Engr. James Asher B. Cabarloc underwent a Phase Array Ultrasonic Testing Training in Singapore. This is in line with the upgrade of the capability of the NDT laboratory on ultrasonic testing. Contrary to the conventional UT, phased array UT come from its ability to use multiple elements to steer, focus and scan beams with a single transducer assembly. Its ability to test welds with multiple angles from a single probe greatly increases the probability of detection of anomalies in the metal samples and greatly make the inspection time faster. Engr. Catalan and Engr. Cabarloc were both certified in Ultrasonic Phased Array Testing Level II in accordance with ASNT RECOMMENDED PRACTICE SNT-TC-1A (2016) by A-Star Training & Consultancy. This additional service is now available at the laboratory.



Overview of the Unified Laboratory Information System (ULIMS).

Setting Up One-Stop Laboratory Services for Global Competitiveness (One-Lab) Project

This project aims to establish a DOST-wide Unified Laboratory Information System (ULIMS) with a comprehensive database of each agency's testing services and real time status of each laboratory. One of its highlights is the establishment of a system of subcontracting services from one laboratory to another, making it easier for customers with various testing and calibration. The said system was being implemented on ATD Laboratories on receiving jobs involving the Accounting Section last May 2016. The operation underwent several adjustments and revisions along the way but overall, it provided a system that paved the way to an improved and more efficient service.

Prototype Development of Five-Coach Centrally Powered Hybrid Electric Road Train (CRT) and Light Hybrid Electric Road Train (LCRT)

The Light Hybrid Road Train or LCRT, which was deployed in Clarkfield Pampanga, was used to carry passengers to and from the Clark Development Center (CDC) starting in May 2016. The beneficiaries of this free ride offered by the Road Train are the employees of MSK Group Work, Inc. and the students of UP Diliman Extension Campus. It was also demonstrated during the 6th PCIEERD Anniversary held at CDC last June 29, 2016.

Likewise, the Regular Hybrid Road Train or CRT was featured during the 2016 National Science and Technology Week wherein visitors and students were allowed to have a glimpse and go inside the Road Train. The CRT was deployed in Cebu City last December 2016 as requested by the Cebu City local government to be demonstrated to the local commuters on routes where there are no Jeepney lines. IMS staff also took part in the techno-promotion activities of the different projects of DOST held in Ormoc, Leyte and Davao City wherein the Road Train is one of the projects promoted.

Student visiting the NSTW 2016 celebration held in MIRDC compound posing happily in front of the camera.

Smiles on the faces of students from the UP Diliman Extension Campus in Clark Pampanga were seen after the free ride to their school courtesy of the reliable Road Train.

The disassembled coaches of the CRT on the barge en route to Cebu City for another exciting techno-promotion of the Road Train.

Rising to the Challenge

The Analysis and Testing Division continues to live up to its commitment of being a prime laboratory for testing and calibration. With the increasing demand to ensure high quality metal products, the team is ready to take the challenge of delivering the best level of service to their internal and external clients.

Planning and Management Division

The Planning and Management Division (PMD) had done its share for the successful celebration of the MIRDC's Golden Anniversary. Being in the forefront of the Center's external networks and linkages, the division successfully facilitated the Center's first international conference, which also resulted to the Center's partnerships and cooperation with international research institutions. The division promoted the Center's active commitment in the development of a thriving aerospace industry in the country. The PMD likewise actively engaged the industry partners by conducting focus group discussion to align the Center's future programs and projects. It also ensured the upgrading of IT infrastructures and developed information systems to improve the Center's delivery of services.

Active participation of Industry Partners during the FGD.

MIRDC Consulting with Industry Partners

The Metals Industry Research and Development Center (MIRDC), in the preparation of its Research and Development (R&D) Agenda for 2017-2022 and Investment Portfolio, conducted a Focus Group Discussion (FGD) with Industry Partners last September 13, 2016 at the MIRDC Board Room. The FGD aimed to align the Center's Programs, Projects and Activities (PPAs) with the industries' needs and development track. By doing so, the benefits of R&D results will be maximized through the enhancement of technology transfer and commercialization to increase the competitiveness of the Metals and Engineering industries.

The FGD was organized and facilitated by the Planning and Management Division (PMD) and the Office of the Executive Director (OED). It was attended by twelve (12) industry partners representing, among others, PDMA, MIAP, and MRSP. The officials of MIRDC such as Executive Director Engr. Robert O. Dizon, who also acted as the FGD moderator, Deputy Executive Director for Research and Development Engr. Jonathan Q. Puerto and PMD Division Head Mrs. Mercedita G. Abutal were also present.

Based on the FGD, the different sectors proposed possible R&D PPAs that will answer the industry's pressing needs. Summary of the needs discussed were as follows:

- Lack of locally manufactured agricultural machineries;
- Outdated industrial and production process;

Engr. Robert O. Dizon acts as FGD Moderator.

MIRDC officials and staff and guests pose during the M&E International Conference.

- Non-automated industrial processes or system;
- Expensive software upgrading for industrial machineries;
- Unavailability of locally manufactured machines, tools, parts and equipment; and
- Unavailability of local aerospace technology.

The industry partners also proposed facilities upgrading that will promote quality of output and open doors for new opportunities such as:

- Establishment of advanced welding facilities;
- Establishment of wind tunnel facilities; and
- Establishment of motorcycle and automotive testing facilities.

MIRDC officials also shared the latest development in MIRDC ventures and international linkages such as:

- MIRDC Taiwan's plan to set-up a satellite office in the Philippines to facilitate technology transfer; and
- Establishment of motorcycle manufacturing in the Philippines with the assistance of MIRDC and DTI to make motorcycle affordable to the Filipinos.

The FGD ended with everyone having high hopes and aspirations with the future of the metals industry in the country that will usher new opportunities and prospects. Inputs from the FGD helped the Center in determining its R&D plans and contributed in the drafting of the DOST's Harmonized R&D Agenda.

MIRDC Hosts International Conference

The Department of Science and Technology (DOST) and the Metals Industry Research and Development Center (MIRDC) goes full-swing this year in its annual celebration of the Metals and Engineering (M&E) Week, an event institutionalized under Proclamation No. 144 issued in 2011. The 2016 M&E Week was bannered by the theme, '50 Years of MIRDC: Half a Century of Partnership with the Metals Industry.'

Coinciding with the Center's Golden Founding

Incoming DOST Secretary Prof. Fortunato T. de la Peña gives his inspirational message.

From left to right: Dr. Rowena Cristina L. Guevara, Dr. Jong-Deok Kim, Dr. Ching-Ming Chen, Dr. Yong-Taek Im, Dr. Kristian Oliver Arntz, Engr. Robert O. Dizon.

Anniversary, the M&E International Conference made a difference as to how the Center usually celebrates the M&E Week. Invited foreign experts from Korea, Taiwan, and Germany shared valuable technological knowhow during the M&E International Conference:

- DR. YONG-TAEK IM, President of Korea Institute of Machinery and Materials (KIMM), Korea
- DR. JONG-DEOK KIM, Principal Researcher of Korea Institute of Industrial Technology (KITECH), Korea
- DR. CHING-MING CHEN, Acting President of Metal Industries Research and Development Centre (MIRDC-Taiwan), Taiwan
- DR. KRISTIAN OLIVER ARNTZ, Head of Department, Laser Materials Processing of Fraunhofer Institute for Production Technology, Germany

Dr. Im presented the 'R&D Collaboration Model of Korea Institute of Machinery & Materials.' He shared the advanced research endeavors conducted by KIMM that had significant impact on Korea's industry and economy. He also emphasized on the need for international research collaboration in order to establish better quality of lives in Korea.

Dr. Kim presented the 'Development of Korean Fine Blanking Technology and Industries.' Fine blanking (FB) technology is a press working process which makes it possible to produce precise finished components cleanly sheared over the whole material thickness in a single stroke. Dr. Kim shared how the development of FB technology from an import based industry into a locally manufactured industry promoted the development of Korea's automotive industry.

Dr. Chen presented 'MIRDC's Role in the Industrial Development of Taiwan.' Being the 3rd largest research center in Taiwan with more than 800 employees, that MIRDC-Taiwan is committed in focusing on innovation in metal-related industries, seeking international collaboration opportunities, and enhancing competitiveness of the Taiwanese metal industry.

Dr. Arntz presented the 'Tool and Die making in Germany.' He shared the status of the tool and die industry in Germany including studies conducted on the tool and die industry supply chains, benchmarking database, and gap analysis.

The conference was attended by 88 local and international stakeholders and 46 MIRDC officials and employees. Worth mentioning was the speech of outgoing DOST Secretary Mario G. Montejo, delivered by DOST Undersecretary Dr. Amelia P. Guevara, recognizing MIRDC as one of the top performing agencies attached to the DOST. He also appreciated the Center's contribution in

MIRDC Management proudly unveils the 50th Anniversary Coffee Table Book.

creating a culture of trust and positive interdependence with the metals industry and the academe.

In his inspirational message, incoming DOST Secretary Fortunato T. de la Peña shared DOST's thrust for the next 6 years and the important role that MIRDC would play in the area of research and development.

Later in the conference, institutions, industry partners, and officials who had made contributions to the existence of the MIRDC were given recognition. Apart from this, a thanksgiving dinner was shared by all attendees in time for the launching of the DOST-MIRDC's 50th Anniversary Coffee Table Book showcasing MIRDC's history and achievements for the past 50 years.

The International Conference ushered in an active partnership with invited foreign institutions. KIMM signed a Memorandum of Understanding (MOU) with MIRDC-Philippines in the areas of: joint research activities; exchange of human resources; participation in workshops, seminars, and trainings; exchange of technical materials, publication and other information; and other activities of mutual interest. Likewise, MIRDC-Taiwan has considered to set a satellite office in the Philippines to facilitate an active technology transfer.

MIRDC Executive Director Robert O. Dizon (extreme left) and DOST Usec. Rowena Cristina L. Guevara (extreme right) give recognition to the Center's trusted and significant industry partners.

Officials and members of the AIAP during their 3rd general membership meeting and election.

AIAP Elects New Set of Board of Trustees and Officers

The Metals Industry Research and Development Center (MIRDC) facilitated the 3rd general membership meeting and election of the Aerospace Industries Association of the Philippines' (AIAP) Board of Trustees for the year 2017–2018 last Dec. 5, 2016 at the MIRDC Gold Auditorium, Gold Building, MIRDC Compound, General Santos Avenue, Bicutan, Taguig City. The election was attended by representatives from several AIAP member-companies.

Below is the set of newly-elected AIAP Board of Trustees and Officers for 2017-2018:

The AIAP BOARD OF TRUSTEES for 2017-2018

John T. Lee – Applied Machining Corporation
Mathew R. Baxter – B/E Aerospace
Cesario S. Chua – CALCO Industries
Alexander T. Javier – DNV GL Philippines
Dennis Y. Chan – Famous Secret Precision Machining, Inc.
Hermingildo Flores – JAMCO Philippines
Takeshi Kurosaka – KAPCO Manufacturing, Inc.
Alfred L. Lee – MESCO, Incorporated
Melvin C. Dy – MD Aerospace Fabrication Services, Inc.
Wilfredo N. Estoque – MOOG Controls Corporation
Nelson S. Barcelona – ONATECH, Incorporated
Lorenzon L. Naval, Jr. – PATTS College of Aeronautics

HONORARY BOARD OF TRUSTEES

Carmelynda V. Samoy – Civil Aviation Authority of the Philippines
Mercedita G. Abutal – Metals Industry Research and Development Center
Com. Gilbert S. Rueras – Philippine Aerospace Development Corp.
David A. Inocencio – Philippine International Trading Corp.

The AIAP OFFICERS For 2017-2018

Dennis Y. Chan – President
Wilfredo N. Estoque – Vice President
Melvin C. Dy – Secretary
Cesario S. Chua – Treasurer
Hermingildo Flores – Auditor

The global aerospace industry is considered to be a very lucrative market and hold a lot of opportunities for Philippine companies. The industry provides MIRDC with an opportunity to develop its expertise in more advanced manufacturing technologies. The Center remains committed to build a strong partnership with stakeholders in the aerospace industry.

MOA Signing at DTI International Building in Makati City.

MIRDC Initiating the Implementation of Quality Management System for Aerospace Industry

On July 27, 2016, at the Innovation Hub of the DTI International Building in Makati City, Trade Undersecretary for Industry Development and Board of Investments (BOI) Managing Head Ceferino S. Rodolfo, Metals Industry Research and Development Center (MIRDC) Executive Director Robert O. Dizon, and Aerospace Industries Association of the Philippines (AIAP) President John T. Lee signed a Memorandum of Agreement (MOA) on the implementation of AS9100 quality management system training and consultancy programs.

In the MOA, the aerospace industry in the Philippines will pursue the implementation of Aerospace Quality Management System (AQMS) leading to AS9100 certification. With funding support from BOI, MIRDC will facilitate the training programs and capability-building activities in coordination with the AIAP for the participating companies. AS9100 training and consultancy programs will commence on the 4th quarter of 2016 or 1st quarter of 2017.

The aerospace industry has a big potential and can become a lucrative investment for Philippine metal companies. MIRDC aims to assist the Philippine metal industries to be at par with other ASEAN nations by acquiring AS9100 certification in the next two years.

Improving Operational Excellence through ICT

As part of the strategic objective for service improvement, strengthening ICT infrastructure to build online facilities to expand the reach of the Center's services is included in the MIRDC Strategic Plan 2015-2025. The Management Information Service (MIS) of the Planning and Management Division plays a vital role in making this happen.

The Center, through the PMD-MIS, has actively participated in the Government-wide Medium-Term Information & Communications Technology Harmonization Initiative (MITHI) of the Department of Budget (DBM) and Department of Information and Communications Technology (DICT). The Information Systems Strategic Plan (ISSP), spearheaded by PMD-MIS, serves as the overall plan in the development of the Center's ICT requirements.

In 2015, MIRDC was granted seventy-six (76) units of desktops/laptops corresponding to the partial fulfillment of the three-year computer replacement program (2011-2013). For this year, the Center received an ICT budget of Php3.7 Million.


PMD-MIS connecting all work stations to the MIRDC LAN.

PMD-MIS facilitates the implementation of the three-year computer replacement program of the Center.

PMD-MIS also provided the groundwork to ensure Php8.8 Million will be received in 2017. The financial support by the national government thru the MITHI program has significantly improved the ICT capability status of the Center.

The acquisition of new desktops and laptops provided work efficiency and mobility to our employees. All workstations acquired thru DBM-Procurement Service (DBM-PS) have licensed software, which contributes to the government commitment of eliminating pirated or unwanted software licenses usage within the public sector. As of October 31, 2016, there are 357 workstations connected to the MIRDC LAN, and eight (8) servers and twenty-five (25) desktops connected to machines. The 1:1 user to computer ratio is not yet fully achieved considering the large number of contract of service personnel. As regards to computer literacy, ninety-nine percent (99%) of employees including contract of service personnel have knowledge on the basic of computers and other related technologies critical in office efficiency.

In 2016, the Center also strengthened its network security protection by acquiring an Enterprise Anti-Virus Application Software. Last October, the local area network (LAN) expansion to the Copper Building (Heat Treatment/ Surface Engineering Facilities), a building that had no LAN connection for a long time, was finally realized. There are now more end-users benefitted with the LAN expansion. The acquisition of a storage server (SNAP server) provides the end-users with a centralized filing system, user control, data security and backup. Another obsolete domain server was replaced with a new server to provide user authentication, active directory, dynamic host and file/printer sharing services.

With the aforementioned developments, the Center is still on its early stages of implementing the five-year ICT Roadmap 2015-2020. The bulk of the budget allocated for 2017 will be for Capital Outlay as the Center implements the project: Establishment and Strengthening of Information and Communication Technology (ICT) Infrastructure (ICT INFRA) and Business Online Solution System (BOSS) of the Center in Support to the Productivity and Competitiveness of the M&E Industries.

PMD-MIS shall also ensure that the Center will continue to support the Integrated Philippine Government (iGov) Project of the Department of Information and Communications Technology (DICT) by subscribing to the various online services such as web hosting, government email (GovMail) and government cloud (GovCloud).

Finance and Administrative Division

> "For 50 years, FAD-AGSS continues to sustain the Center's mandate by building and sustaining its human capital advantage."

The Metals Industry Research and Development Center (MIRDC) has filled-up a total of 215 positions by the end of 2016. This created a 96.13% sustained human resource based from its 226 approved plantilla positions. Personnel movement during the year was a result of (8) promoted staff, two (2) transferees from the DOST Central Office, ten (10) newly hired personnel and four (4) retirement from government service.

One of the major highlights of strengthening the Center's workforce was the conferment of Engr. Robert O. Dizon as MIRDC's new Executive Director in early January of 2016.

Yet again, MIRDC congratulates the following personnel:

New Employees/Transferees:

Robert O. Dizon
Executive Director
(Transferee from DOST-Central Office)

Ivy Marie P. Palma
Administrative Officer IV
(Transferee from DOST-Central Office)

Franz Joseph D. Libao
Sr. Science Research Specialist

Alexander P. Gonzales
Planning Officer III

Pablo M. Balontong, Jr.
Administrative Aide IV

Felix M. Noguera, Jr.
Administrative Aide IV

Eduardo C. Sevilla
Administrative Aide III

New Employees:

Trinmar A. Boado
Computer Programmer III

Jan Michael E. Saludes
Metals Technologist II
Temporary

Carlo U. Rasco
Metals Technologist II
Temporary

Pedrito A. Domingo, Jr.
Metals Technologist II

Arby F. Coria
Administrative Assistant III

Promoted Personnel:

Restituto Felipe R. Gabuya
Planning Officer IV

Abigail M. Casas
Administrative Assistant III

Vincent Boy E. Manabat
Science Research Specialist II

Samuel A. Ysit
Electronics and Communications Equipment Technician III

Christine P. Avelino
Science Research Specialist II

Joel A. Eligue
Electrical Inspector II

Walter V. Bonggat
Metals Technologist III

Arnold R. Habana
Administrative Aide VI

In brief, MIRDC's human resource is as follows:

	Research & Development			Technical Services		
	OED	MPRD	PD	PMD	ATD	TDD	FAD
Engineers	3	10	16	1	14	12	3
Non-Engineers (Technical)	-	18	26	13	19	3	
Admin/Support/Non-Technical	2	5	7	4	3	19	37

Retirees:

As the new generation of MIRDC personnel ventures into the beginning of their career growth in the science and technology sector, there are some who have reached the peak of their public service and started to delve into their own personal endeavor. Personnel who were separated from government service by 2016 are as follows:

Retiree	Retirement Date/ Years in Service
1. Cesar B. Andres	August 1, 2016 / 21 yrs.
2. Nimfa O. Usero	November 11, 2016 / 41 yrs.
3. Romulo V. Alano	August 1, 2016 / 39 yrs.

1. Cesar B. Andres
Metals Technologist III
MPRD

2. Nimfa O. Usero
Administrative Officer V

3. Romulo V. Alano
Administrative Aide III
FAD

FAD organized a send-off celebration for Romulo V. Alano and Nimfa O. Usero. Engr. Robert O. Dizon, and Engr. Jonathan Q. Puerto awarded the retirees with a plaque of recognition for their valuable years of service at MIRDC.

In memoriam:

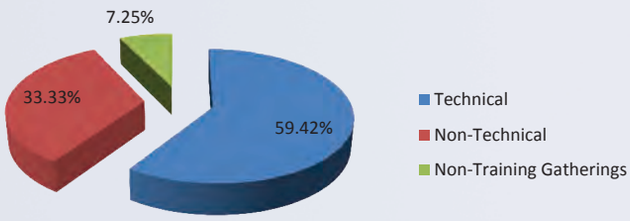
Francisco M. Dela Peña
Metals Technologist III
Deceased
26 April 2016
31 Years in Public Service

Amidst these tributes, MIRDC grieved the loss of one of its personnel, Mr. Francisco M. dela Peña of the Materials and Process Research Division last April 26, 2016, who rendered a total of 31 years in public service.

Career and Personnel Enrichment

On its quest to meet the increasing demand on upgrading personnel competency, the Finance and Administrative Division - Administrative and General Services Section (FAD-AGSS) successfully implemented a total of sixty nine (69) training programs accomplishing 109.52% of MIRDC's approved Annual Learning Development Plan by December 2016. Programs implemented were classified as technical, non-technical and non-training related gatherings distributed accordingly as shown in the graph.

2016 ALDP Program Percentage Distibution by Classification



Forty eight (48) unplanned local training programs, twenty three (23) foreign training programs, and eleven (11) scholarship programs were facilitated during the year. These programs have contributed to the increase in awareness on the latest updates in technology, government policies and international linkages. Over-all, FAD-AGSS implemented a total of one hundred forty (140) planned and unplanned training programs.

Highlights of Training Activities

During the first semester, the Center was able to mobilize its Total Quality Management Committee through the conduct of Quality and Environmental Management System (QEMS) related programs.

It involved the upgrading of MIRDC's QEMS Internal Auditors and Process Owners as well as orientation of new employees through the conduct of awareness programs on *ISO 9001:2015 Standard, Risk Management* and *5S* that were spearheaded by *Dr. Danilo N. Pilar,* the Center's Quality Management Representative (QMR).

Likewise, all concerned TQM officers and members underwent a series of upgrading and re-orientation programs through outsourced training providers.

QMS programs implemented:

Program Title	Date Conducted
1. Risk Management Seminar	February 3, 2016 March 3, 2016 March 28, 2016 March 30, 2016 November 18, 2016 (c/o ITS)
2. Awareness on ISO 9001:2015	February 26, 2016 March 17, 2016
3. 5S Awareness Program	August 18, 2016

FAD personnel attend Awareness Seminar on ISO 9001:2015 and Risk Management.

Dr. Danilo N. Pilar and participants of the 5S Awareness Seminar, August 18, 2016.

Furthermore, several orientation/re-orientation programs on EMS related activities for new employees were also conducted in cooperation with the Center's Environmental Management Representative, Engr. Rodnel O. Tamayo, and the Emergency Preparedness and Response Group headed by Engr. Florante A. Catalan and Engr. Rommel N. Coroña.

Training providers:

Program Title	Date Conducted	Training Provider
1. ISO 9001:2015 Transition	February 10, 2016	TUV-SUD
2. Basic Course for Pollution Control Officer	April 5-8, 2016	ECI Philippines
3. Orientation/Re-Orientation on Fire Safety	April 8, 2016	Bureau of Fire Protection – Taguig Chapter
4. Safety Officer Accreditation Course	July 25-29, 2016	Safety Officers of the Philippines, Inc.
5. Basic First Aid & Life Support	August 2-3, 2016	Philippine Red Cross
6. Understanding ISO/IEC 27001:2013 ISMS	October 3, 2016	Neville Clark through ONE-LAB Project
7. Appreciation Course on ISO 14001:2015	November 15, 2016	Synergized Macro Solutions, Inc.

Activity	Date Conducted	Resource Speakers/Facilitators
1. Orientation on MIRDC EMS	May 5, 2016	Gina A. Catalan
2. Awareness Seminar on Basic Occupational Safety	May 12, 2016	Florante A. Catalan
3. Center-Wide FIRE DRILL	April 8, 2016	BFP with MIRDC EPRG
4. Metro Manila Shake Drill	June 22, 2016	MIRDC EPRG/Security Services

Snippets of the MIRDC EMS Activity

2016 Fire Drill Seminar and Actual Drill conducted by the Bureau of Fire and Protection in cooperation with MIRDC's EPRG.

2016 Basic First Aid and Life Support Seminar conducted by the Philippine Red Cross.

TQM Committee members attended the Appreciation Course on ISO 14001:2015 conducted by Synergized Macro Solutions, Inc.

Orientation/Re-Orientation on MIRDC QEMS.

Moving towards the Center's goal for continual improvement, the top management supported the implementation last September 20-21, 2016 of the seminar on Awareness on Philippine Quality Award conducted by the Development Academy of the Philippines and participated in by the PQA Committee Technical Working Group together with the Head of Agency, Engr. Robert O. Dizon.

With the objective of uplifting its personnel's morale and sustaining their patriotism and ethical code of conduct as public servants, FAD-AGSS in cooperation with the Civil Service Commission implemented last August 10-12, 2016 the first batch of *Values Orientation Workshop*. This was conducted by ***Director Emma Barerra,*** a CSC accredited VOW facilitator, who happens to be one of the pioneers in the development of CSC's VOW program module. A total of thirty-two (32) MIRDC personnel hired from 2010 to 2016 successfully completed the workshop.

Concluding FAD-AGSS's Annual Learning Development Program was the completion of the implementation of the project entitled, *"Strengthening S&T Capabilities Through Competency-Based Human Resource Management for the Department of Science and Technology Agencies."*

Approved by the DOST-HRDP with a PhP 1.041M budget allocation, MIRDC in cooperation with the Civil Service Institute-Civil Service Commission, conducted four (4) modules on Competency-Based Human Resource Management that commenced last September 7, 2016. These modules were; (1) Competency Modeling and Profiling (September 7-9, 2016), (2) Development of Competency-Based Qualification Standard and Job Description (October 5-7, 2016), (3) Competency-Based Assessment (October 26-28, 2016) and (4) Competency-Based Integration (November 22-23, 2016).

Engr. Robert O. Dizon delivers the Opening Remarks and members of the Management Committee participate in unfreezing activity and workshops.

Engr. Robert O. Dizon during the Opening Ceremony of the project entitled, 'Strengthening S&T Capabilities Through Competency-Based Human Resource Management for the Department of Science and Technology Agencies" and participants from DOST Agencies and MIRDC personnel pose for a class picture together with Ms. Jocelyn Linsao-Ng, CSI-CSC Resource Speaker.

A total of forty (40) participants successfully completed the 11-day training program acquiring an estimated 80-hours of leadership and management training under the CSI-CSC program. Aside from MIRDC, recipients of this project came from the different DOST agencies like ITDI, PTRI, FNRI, PCAARRD, FPRDI, NAST, NRCP, PCHRD, PCIEERD, STII and DOST Central Office.

MIRDC's Technical Working Group on Competency Framework during workshops and unfreezing activities.

DOST participating agencies with Ms. Jocelyn-Linsoa-Ng of CSI-CSC.

Dr. Agustin M. Fudolig during the closing ceremony of the project entitled, "Strengthening S&T Capabilities Through Competency-Based Human Resource Management for the Department of Science and Technology Agencies" and the participants from DOST Agencies and MIRDC personnel with Engr. Robert O. Dizon on their candid pose for a class picture together with Ms. Jocelyn Linsao-Ng, CSI-CSC Resource Speaker.

Doctorate Degree Programs:

1. Anthony Greg F. Alonzo	Business Administration Polytechnic University of the Philippines, Manila	DOST HRDP
2. Concesa T. Cortez	Public Administration Polytechnic University of the Philippines., Manila	DOST-HRDP
3. Arlene G. Estacio	Electronics Engineering Mapua Institute of Technology	DOST-HRDP

Master's Degree Programs:

1. Sharon S. Abilay	MS Electrical Engineering Technological University of the Philippines., Manila	DOST HRDP
2. Louren Joy G. Asmando	Master in Technology Technological University of the Philippines., Manila	DOST-HRDP
3. Gharry M. Bathan	MS in Mechanical Engineering Technological University of the Philippines., Manila	DOST-HRDP
4. Sheena S. Bedis	MA in Economics Polytechnic University of the Philippines., Manila	DOST-HRDP
5. Florante A. Catalan	MS in Mechanical Engineering Technological University of the Philippines., Manila	DOST-HRDP
6. Zalda R. Gayahan	Master in Technology Management University of the Philippines, Diliman, Quezon City	DOST-HRDP
7. Allan John S. Limson	MS in Mechanical Engineering Technological University of the Philippines., Manila	DOST-HRDP
8. Joein L. Luces	MS in Mechanical Engineering Mapua Institute of Technology	DOST-HRDP
9. Osric Primo Bern A. Quibot	Master in International Development (Program in Rural and Regional Development Management)	JDS/JICE
10. Mildred J. Viernes	Master in Information Technology University of the Philippines, Los Baños, Laguna	ASTHRD (DOST-SEI)
11. Linda G. Rivera	Master in Business Administration Pamantasan ng Lungsod ng Maynila	DOST-HRDP (New Scholarship Grant - 2016)
12. Christian M. Ibañez	MS in Electrical Engineering Technological University of the Philippines, Manila	DOST-HRDP (New Scholarship Grant - 2016)
13. Mary Joy M. Bautista	MS in Chemistry University of Santo Tomas	DOST-HRDP (New Scholarship Grant - 2016)

Scholarship Program

Scholarship grants coming from several sponsoring agencies such as the DOST-HRDP, SEI and JDS/JICE helped develop MIRDC personnel in the aspect of academic excellence and advancement. Currently, the Center is a beneficiary of sixteen (16) scholarship grants covering the period 2010 -2016, mostly from the DOST-HRDP scholarship program.

By the end of 2016, five (5) personnel successfully completed their scholarship program one of which was under the Incentive Program for Self-Financed Graduates of Doctoral and Master's Degrees approved by the DOST-HRDP Committee last November 7, 2016.

Concesa T. Cortez
Doctorate in Public Administration
Polytechnic University of the Philippines, Manila
Graduated December 2016

Anthony Greg F. Alonzo
Doctorate in Business Administration
Polytechnic University of the Philippines, Manila
Graduated December 2016

Zalda R. Gayahan
Master in Technology Management
University of the Philippines, Diliman, Quezon City
Graduated June 2016

Osric Primo Bern A. Quibot
Master in International Development
(Program in Rural and Regional Development Management)
Nagoya University, Japan
Graduated October 2016

Rea C. Castro
Master of Science in Industrial Engineering
University of the Philippines, Diliman, Quezon City
Graduated June 2016
(Incentive Program for Self-Financed Graduates of Master's Degree)

2016 National Women's Month Celebration

In support of the government's Gender Sensitivity Programs, MIRDC has been actively participating in the activities of the National Women's Celebration.

Last March 16, 2016, the Philippine Council for Women (PCW) in cooperation with the DOST-GAD Focal Point System launched the nation-wide celebration of National Women's Month themed as *"Kapakanan ni Juana, Isama sa Agenda"* held at the Burnham Green, Quirino Grandstand, Rizal Park, Manila. The Center deployed a total of twenty (20) personnel coming from different divisions to take part in the celebration. Adjunct to this was the *DOST-Wide Women's Month Celebration* held last March 31, 2016 at the DOST Grounds wherein MIRDC Officials and employees were in attendance.

MIRDC GAD Advocates:


DOST Secretary Mario G. Montejo receives the Legacy Trophy from MIRDC Executive Director Engr. Robert O. Dizon together with his Deputy Executive Directors Dr. Agustin M. Fudolig and Engr. Jonathan Q. Puerto.

DOST Secretary Mario G. Montejo gave his speech upon awarding of the Legacy Trophy.

MIRDC 50th Anniversary

"MIRDC @ 50: Gold at Its Finest" became the theme of the celebration of Center's Golden Anniversary held last June 16, 2016 at the Taguig City University (TCU), Bicutan, Taguig City. All employees came in their formal attire complementing the gold and black motif of the event.

One of the major highlights of the activity was the awarding of the Legacy Trophy to the outgoing Secretary of the Department of Science and Technology, Engr. Mario G. Montejo, for his significant contribution in the metals and engineering (M&E) industry. Commonly known as the "Abueva Cup," the trophy is a brass replica of the sculptured work by National Artist Napoleon Abueva who was commissioned by MIRDC in late 1977.

The celebration also included the launching of the **VOW of Commitment** of each division marking MIRDC'S transition towards its commitment for technology advancement for the next 50 years.

The Top Management, headed by Executive Director Engr. Robert O. Dizon, took the lead in the presentation of their own VOW of Commitment by embarking on the symbolic lighting of the Commitment Candle. Completing the ceremonial task was the participation of the Deputy Executive Director for Technical Services, Dr. Agustin M. Fudolig, and the Deputy Executive Director for Research and Development, Engr. Jonathan Q. Puerto, together with their respective Division Heads. By cascading the light to illuminate the rest of the crowd's individual candles, all were enjoined to partake in the solemnity of the event. This prompted the presentation of MIRDC's New Institutional Video in the tune of the MIRDC Hymn. As closure to the said activity, everyone was enjoined to sign their name at the Commitment Board to seal-in their personal commitment towards a better MIRDC.



Vow of Commitment Candle Ceremony.



The FAD Family and photo opportunity with the Executive Director.


Mancom and staff playfully participate in the parlor games.

Stars of the Day, Engr. Jayson P. Rogelio and Ms. Catherine Bolido.

MIRDC 2016 Awards and Recognition

In recognition of their valuable years in public service and exemplary performance in their field of specialization, the MIRDC PRAISE Committee awarded the following personnel:

Title of Award	Name of Awardees
LOYALTY AWARD	
Twenty (20) Years	Angelito N. Pilar (3/2/16)
	Lina B. Afable (7/11/16)
	Maria Gracia M. Peralta (9/24/16)
	Adonis T. Marquez (12/7/16)
Twenty-Five (25) Years	Linda G. Rivera (8/17/16)
Thirty Five (35) Years	Ely C. Delos Reyes (5/19/16)
	Luisito N. Alcantara (5/19/16)
	Rebecca C. Jabson (7/7/16)
Forty (40) Years	Benson A. Ragasa (7/28/16)
	Serafin N. Garcia (8/11/16)
	Rosalinda M. Cruz (12/2/16)
PERFORMANCE EXCELLENCE	
For Year 2015	Eunice A. Bautista
	Zalda R. Gayahan
3 Consecutive years (2013-2015)	Ronaldo L. Agustin
4 Consecutive years (2012-2015)	Reynaldo M. Loreto, Jr.

Title of Award	Name of Awardees
Division Model Employee	
Level I	Karl Andrew S. Chavez
	Edmundo C. Sevilla
	Serafin G. Aguilar
	Augusto S. Atanacio, Jr.
	Alfredo Z. Panganiban
	Reynaldo M. Loreto Jr.
Level II	Edward A. Malit
	Rosario D. Sancon
	Lemuel N. Apusaga
	Jayson P. Rogelio
	Eric B. Casila
	Zalda R. Gayahan
MIRDC Model Employee	
Level I	Edmundo C. Sevilla
Level II	Jayson P. Rogelio
Best Organizational Unit	Metrology Laboratory Unit
CORE VALUES	
Professionalism	Reynaldo O. Bayot
Responsiveness	Lemuel N. Apusaga
Integrity	Katherine T. Llanto
Dynamism	Laila R. Porlucas
Excellence	James Asher B. Cabarloc
Graduate Studies	-
	Rea C. Castro
	Osric Primo Bern A. Quibot
	Zalda R. Gayahan
	Concesa T. Cortez
	Anthony Greg F. Alonzo
Licensure Exam (RA 1080)	-
Electronics Engineer (ECE) and Electronics Technician (ECT)	Karl Andrew S. Chavez
Electronics Engineer (ECE) and Electronics Technician (ECT)	James Asher B. Cabarloc
Innovation Award	Process Research Section
UTILITY MODEL	-
1. Water Removal Through a Freeze Drying Machine	Ronie S. Alamon
	Isidro D. Millo
	Jose B. Ferrer
2. Compact Rice Mill Diverting Chute	Joein L. Luces
	Nico Deus O. Villafranca

Title of Award	Name of Awardees
Scientific Paper Published	
1. Design and Development of Sugarcane Loader for Small-Scale Farms	Isidro D. Millo
	Emerito V. Banal
	Ronie S. Alamon
	Raymond S. De Ocampo
	Pepito M. Soriano, III
	Geoffrey L. Abulencia
2. An Electric Shake Table System for Disaster and Emergency Preparedness Training	Gharry M. Bathan
	Jose B. Ferrer
	Vincent Boy E. Manabat
	Fred P. Liza
	Cameron B. Yao
	Renann G. Baldovino
3. An Integrated Control System of Batch-Type Fluidized Bed Dryer (FBD) System for Stabilized Brown Rice	Remartin S. Maglantay
	Renann G. Baldovino
	Allan John S. Limson
	Fred P. Liza
	Jonathan Q. Puerto
4. A Low-Cost Integrated Control System for the 3-axis Computer Numerical Control (CNC)	Jayson P. Rogelio
	Renann G. Baldovino
	Allan John S. Limson
	Fred P. Liza
	Jonathan Q. Puerto
5. A Fuzzy-Pulse Width Modulation Control Algorithm for a Computer Numerically Controlled Laser Machine	Cameron B. Yao
	Jayson P. Rogelio
	Renann G. Baldovino
Scientific Paper Published in Scopus	
An Electric Shake Table System for Disaster and Emergency Preparedness Training	Gharry M. Bathan
	Jose B. Ferrer
	Vincent Boy E. Manabat
	Fred P. Liza
	Cameron B. Yao
	Renann G. Baldovino

Collage of MIRDC Awardees















In acknowledgement of their respective achievements for the year 2016, MIRDC congratulates the awardees for their significant contributions in public service.

2016 MIRDC Thanksgiving Celebration

With all the accomplishments that MIRDC have achieved as a result of hardwork and undying commitment to public service, the Finance and Administrative Division facilitated a simple Thanksgiving Celebration.

As a sign of prosperity for the upcoming year 2017, the wearing of anything "Polka Dots" was encouraged among participating guests and employees.

This event resulted to a 92.17% turn-out based on the 215 filled-up position of MIRDC as of year-end 2016.

Snapshots of the 2016 MIRDC Thanksgiving Celebration








> Accountability is considered paramount to good governance. It sets responsibility to individuals who were given authority to protect, develop and manage resources effectively and efficiently.

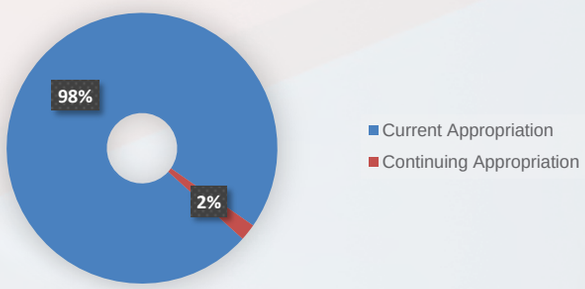


Figure 1. 2016 Approved Budget

The year 2016 marked a turning point of the Metals Industry Research and Development Center (MIRDC) as the agency celebrated its 50th founding anniversary. Through the years, the Center has undergone a series of transformations that made itself a monument of triumph. The Center successfully delivered its mandated programs and projects by efficiently and effectively utilizing its limited resources, establishing a good partnership with the industry and other government agencies, and by developing competent manpower.

The premier in metals research and development agency has always made itself ready to support the programs and thrusts of every administration that sets the direction of our country's economy. By being proactive and flexible, the Center is always ready to embrace change.

On its golden year, the agency proved its capacity to improve and sustain its operations as it solidified its foundation.

The Center strongly observe due diligence and utmost responsibility in utilizing its financial resources. For the year in review, hereunder are the financial information relevant to MIRDC 2016 fiscal operations.

Regular Fund: Source and Utilization

In 2016, the biggest chunk of the Center's budget was directed towards research, promotion and development of science and technology under its banner programs which gained prominence due to its unique and catalytic characteristics.

Allotment and Obligation

The Center has a total approved budget of PhP 339,684,285.57. Of which, PhP 333,201,352.00 (98%) was for the current year's appropriation and PhP 6,482,933.57 (2%) was for the continuing appropriation or budget accounted for in prior year as shown in Figure 1.

Under the current appropriation, 45% or PhP 149,879,952.00 (inclusive of RLIP) was allotted for Personnel Services (PS), 12% or PhP 38,455,400.00

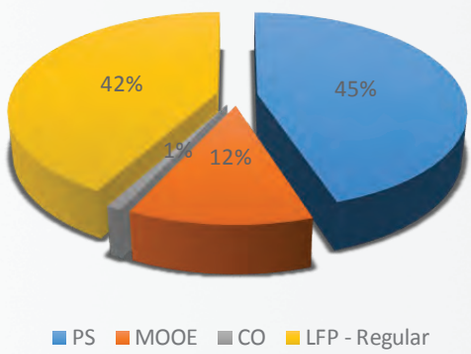


Figure 2. 2016 Current Appropriation

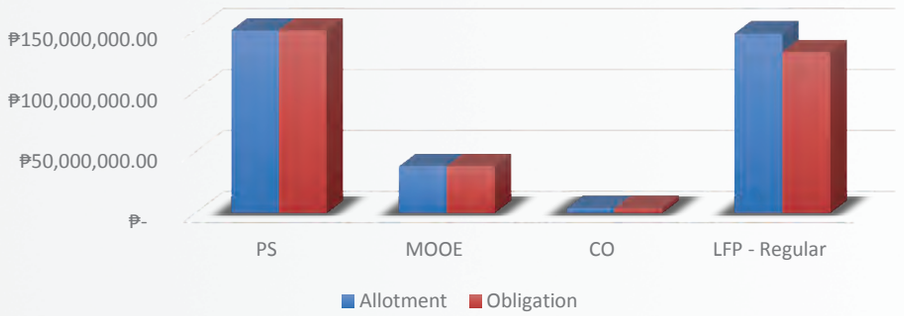


Figure 3. Allotment Received vs Actual Obligation

Source: MIRDC-FMS Budget Unit

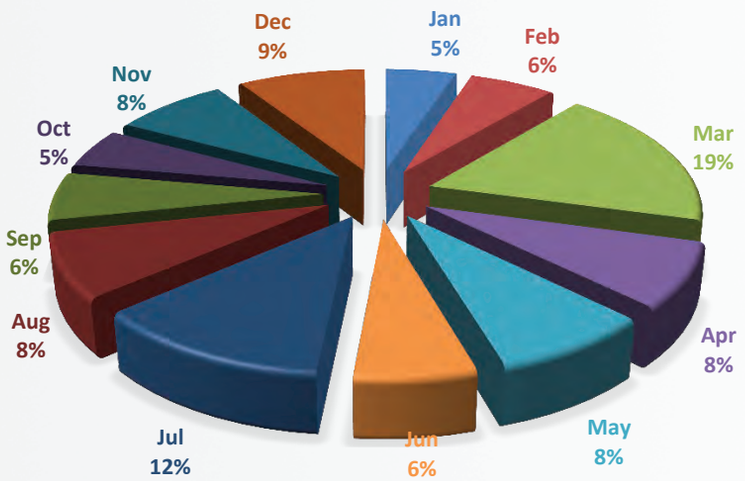


Figure 4. 2016 Cash Allotment Received

Source: MIRDC-FMS Accounting Unit

for Maintenance and Other Operating Expenses (MOOE), 1% or PhP 3,706,000.00 for Capital Outlay (CO) and 42% or PhP 141,160,000.00 for Locally Funded Projects (LFP) – Regular as shown in Figure 2.

Of the total allotment received, the Center obligated PhP 324,399,525.90 or posted 96% budget utilization rating for the year 2016 as detailed in Figure 3.

Cash Allocation and Utilization

For the year 2016, the Department of Budget Management (DBM) released a total cash of PhP 313,896,328.00 to the Center's Regular MDS Account as detailed in Figure 4.

Of the total cash allotment received for Regular Fund for the year 2016, PhP 308,851,858.08 were disbursed posting a 98% utilization rate as exhibited in Figure 5.

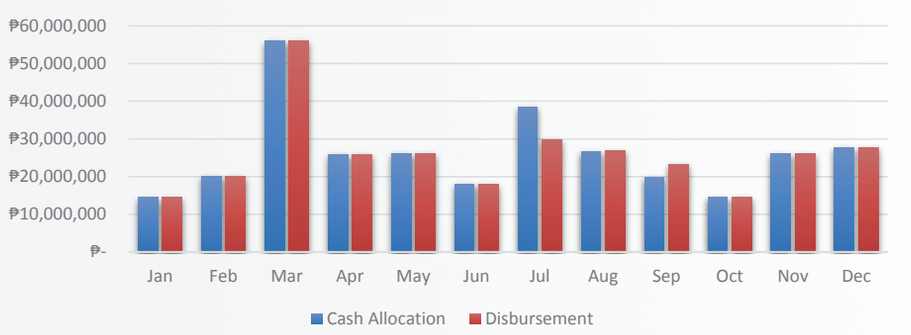


Figure 5. 2016 Cash Allocation vs Disbursement (Regular Fund)

Source: MIRDC-FMS Accounting Unit

Table 1. Schedule of Fund Transfers from Funding Agencies in 2016

Funding Agency	Project Description	Amount
CLSU	Design and Dev't. of Forage-Blades and Chopper for Goat Production	647,224.00
DFA	Prototyping and Pilot Production of Eyelet Riveter/Machine	1,020,199.48
DOST	Setting-up of One-Stop Laboratory Services for Global Competitiveness (ONELAB)	5,763,490.89
DOST	Human Resource Intervention for Sustainable Growth and Competitiveness of the M&E Sector: Development and Implementation of Appropriate Training Curriculum Design for CNC Machine Tool Programming	396,101.65
DOST	Development of Prototype Trainset	4,958,236.57
DOST	Establishment o a Gear Making and Assembly Facility	103,035,453.10
DOST	Development of Tent System for Emergency Application	87,358.64
DOST	Roll-out of DOST-Developed Food Processing Equipment to the Regions	30,394,672.77
DOST	Development of 12HP Single Cylinder Diesel Engine	5,026,223.50
DOST	Study on the Viability of Deploying DOST-developed Mass Transportation Technologies in Baguio City and La Trinidad	101,476.00
DOST	Development of Vacuum Oil Quench Heat Treatment Furnace	315,009.35
DOST	Strengthening the Project Management and Engineering Design Services Office at DOST-MIRDC Compound	2,682,844.38
DOST	Design and Development of Process Equipment for Food Processing Firms	859,390.75
DTI-ARMM	Establishment of Crucible Furnace Facility for Brass Casting	92,467.05
DTI-BOI	Enhancing Tool and Die Industry Competitiveness by Expanding the Pool of Trained and highly Skilled Die and Mold Designers and Makers. (D2M2 Project)	7,571,889.92
PCAARRD	Design and Development of Hand Tractor Attachments (Harvester and Transplanter)	515,977.20
PCAARRD	Piloting of Hand Tractor-Attached Harvester and Hand-Tractor Attached Transplanter in Selected Rice Growing Regions	3,295,937.55
PCAARRD	Design and Development of Sugarcane Harvesting Equipment for Small Sugarcane Farms	5,268,599.97
PCAARRD	Development of a Fluidized Bed Dryer for Production of Stabilized Brown Rice (SBR)	4,013,806.77
PCAARRD	Retrofitting of Compact Rice Mill for Stabilized Brown Rice	47,987.37
PCAARRD	Design and Dev't of Superheated Steam Treatment System for Stabilized Brown Rice	3,280,313.87
PCIEERD	Development of Prototype Trainset	4,690,000.00
PCIEERD	Development of a Heavy Duty DC Inverter SMAW-GTAW Welding Machine (Shielded Metal Arc Welding-Gas Tungsten Arc Welding)	230,000.00
PCIEERD	Test and Evaluation of 120-Passenger per Coach Capacity Automated Guide-way Transit System"	1,054,357.24
PCIEERD	Performance Testing of a Five-Coach Centrally Powered Electric Hybrid Road Train for Local Application Phase II	2,298,487.99
PCIEERD	Design and Fabrication of Equipment for the Production of Local Cocoa Products	281,584.03
PCIEERD	Simulation and Evaluation of AGT System Passenger Stations-Phase 2	566,082.65
TAPI	Fabrication of the 3D Print Prototype Scale Model of the Continuous-Type Food Processing Equipment	143,000.00
	Fund Transfers for existing programs and projects	***188,638,172.69***
DOST	Strengthening S&T Capabilities Through Competency-Based Human Resource Management for Department of Science and Technology	1,041,950.00
DOST 7	Technology Promotion and Field Testing of the Hybrid Electric Road Train in Cebu City	2,484,000.00
DTI	Supporting Philippine Companies in the Preparation and Implementation of an Aerospace Quality Management System (AQMS) Aligned with AS9100 Requirements	387,998.00
PCIEERD	2016 National Science and Technology Week	87,500.00
PCIEERD	Design and Optimization of Austenitic Manganese Steel Liner for Phil. Aggregates and Mineral Processing	2,402,141.00
TAPI	2016 National Science and Technology Week (NSTW) on July 25-29, 2016	200,000.00
TAPI	Technology Promotion of Road Train in Metro Manila and Pampanga	1,665,000.00
	Fund Transfers for new projects, 2016	***8,268,589.00***
	TOTAL	**196,906,761.69**

Source: MIRDC-FMS Accounting Unit

Trust Receipts: Source and Utilization

MIRDC initiated and undergone collaborative projects with other agencies that respond to domestic needs and provide support to other industries. The Center received a total amount of PhP 196,906,761.69 from its partner-agencies as shown in Table 1. This amount represents funding support to manage programs and projects, develop models, fabricate parts and build equipment. It also includes additional funding support for the continuity of existing programs and projects.

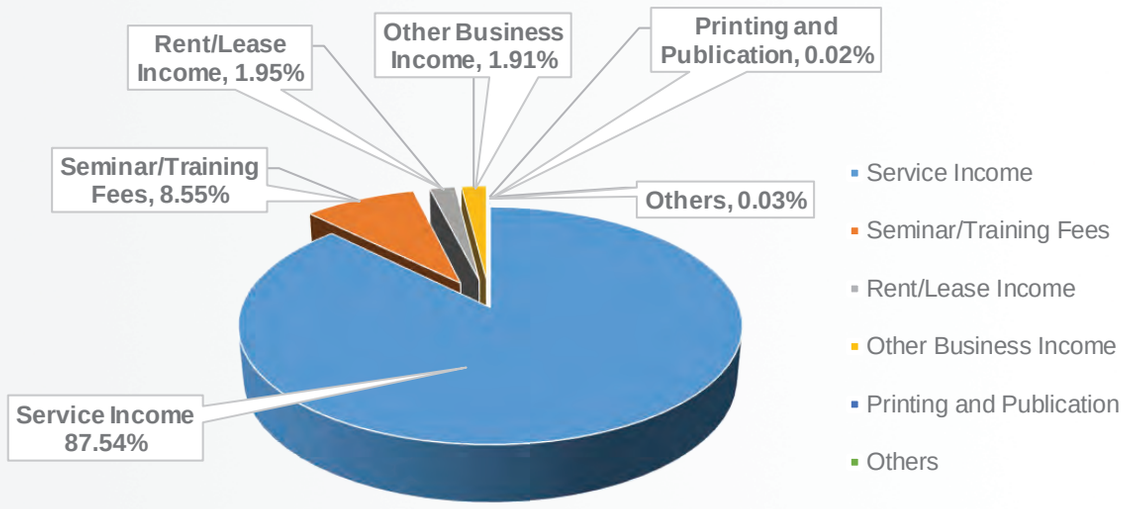


Figure 6. 2016 Distribution of Revenue Generated

Source: MIRDC-FAD Cash Collection Unit

The total amount released by the DBM was PhP 205,319,497.00 to cover trust receipts for the expenditures of programs and projects to be undertaken by the Center. The amount was inclusive of reverted cash balance of Trust MDS Account as of EOY 2015.

Of this amount, the Center disbursed PhP 143,076,102.41 or 70% of the total cash allocation for the year 2016.

Revenue Generated

MIRDC served various companies and other government offices in the field of metals and engineering industry particularly in metal fabrication, metal analysis, calibration and testing. The Center also provided specialized trainings to individuals and technical consultations and advisory services in the areas of metals and engineering, quality standards and intellectual property.

Out of these activities, the Center was able to generate revenues from the different services it provided and out of business incidental to its operations. These revenues were subsequently deposited to the National Treasury.

The total amount collected from various sources of revenue during the year was PhP 24,260,000.00 as detailed in Figure 6.

Figure 6 includes constructive income generated out of fines and penalties imposed against the agency's suppliers.

GOVERNING COUNCIL MEMBERS

FORTUNATO T. DELA PEÑA
DOST Secretary/Ex-Officio Chairperson
(Beginning July 2016 - Present)

MARIO G. MONTEJO
Former Secretary, DOST
(Until June 2016)

ROBERT O. DIZON
Executive Director, MIRDC

JIMMY T. CHAN
Metals Industry Sector

ALBERTO M. ALBANO
Engineering Industry Sector

MARCELO B. VILLANUEVA
Allied Industry Sector

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(Representative of Leo S. Jasareno)
DENR - Mines and Geosciences Bureau

GERARDO P. MAGLALANG
(Representative of Anne Claire C. Cabochan)
DTI - Bureau of Product Standards

TEODORO S. SOLSOLOY
Department of Agriculture

AMELITO E. UMALI
(Representative of Ma. Corazon H. Dichosa)
DTI - Board of Investments

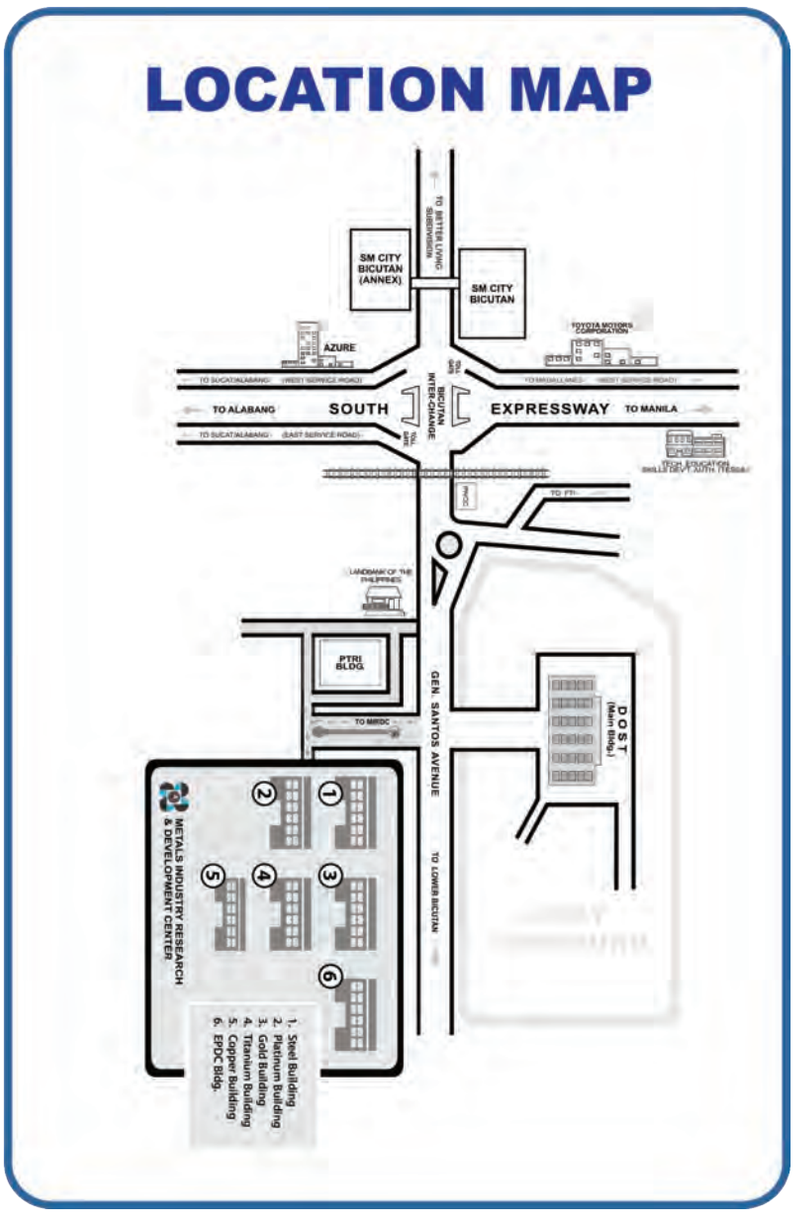
BRENDA R. MENDOZA
National Economic & Development Authority

CHITA O. ANGELES
Council Secretary/Legal Counsel

The Management

From left: **Engr. Rodnel O. Tamayo** (Chief, Materials and Process Research Division), **Ms. Mercedita G. Abutal** (Chief, Planning and Management Division), **Engr. Fred P. Liza** (Chief, Prototyping Division), **Engr. Robert O. Dizon** (Executive Director, MIRDC), **Engr. Jonathan Q. Puerto** (Deputy Executive Director for Research and Development), **Atty. Trixie Hazel C. Veluz** (Attorney IV), **Dr. Agustin M. Fudolig** (Deputy Executive Director for Technical Services), **Dr. Rio S. Pagtalunan** (Chief, Analysis and Testing Division), **Dr. Danilo N. Pilar** (Chief, Technology Diffusion Division), and **Ms. Aurea T. Motas** (Chief, Finance and Administrative Division).

LOCATION MAP & EXTENSION OFFICES



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Tel. No.: (033) 320-0908
Fax No.: (032) 320-0908
Contact Person: Engr. Felipe G. Pachoco

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J. R. Borja Memorial Hospital Compound
Carmen, Cagayan de Oro City 9000
P.O. Box 150
Tel. No.: (088) 858-3931 (Admin)
(088) 858-3932 (Director's Office)
(088) 858-3933 (Technical)
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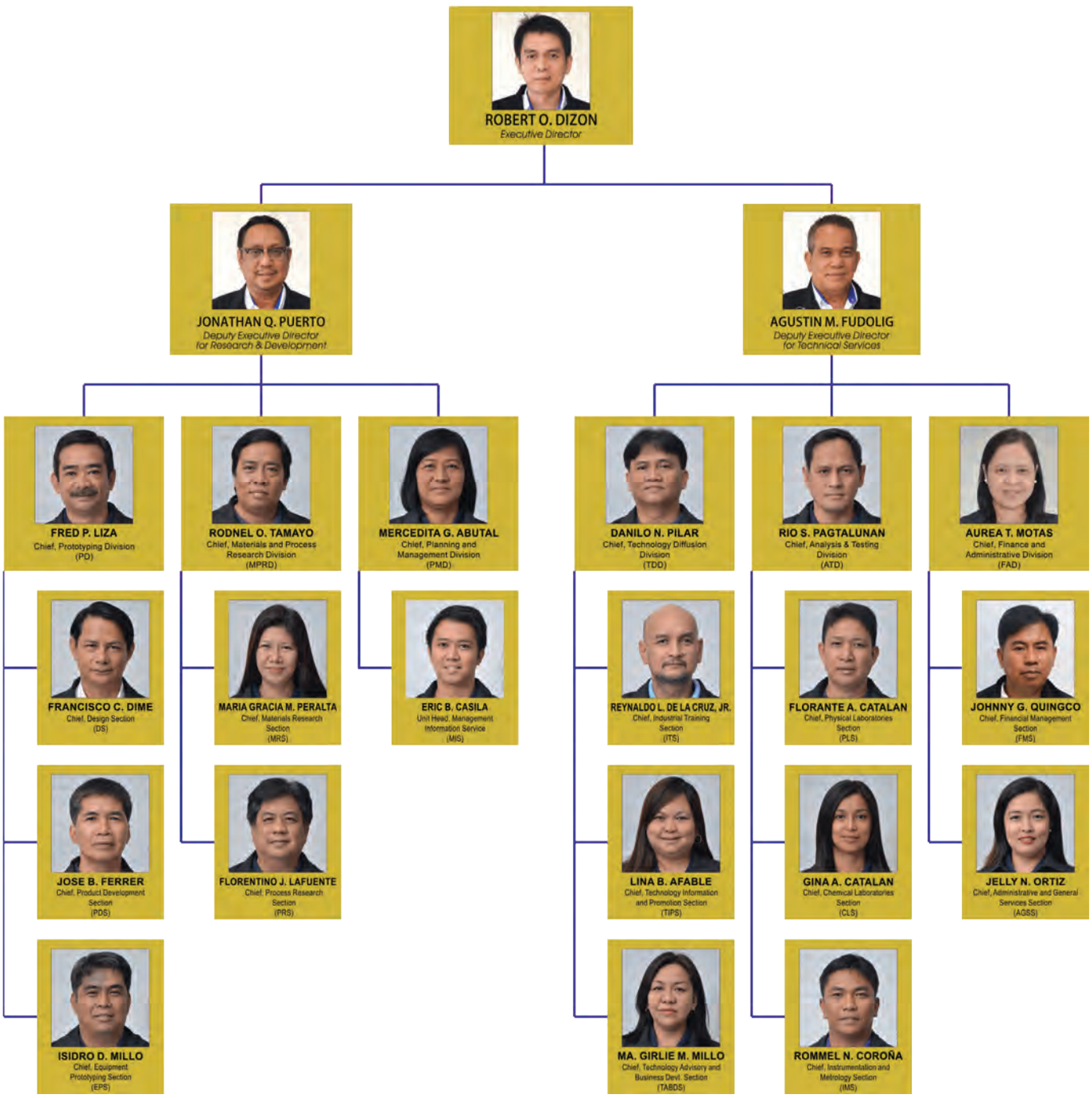
MIRDC ORGANIZATIONAL STRUCTURE



MIRDC HYMN

Kaya Ko, Kaya Mo, Kaya Nating Lahat

Tungkulin mo't tungkulin ko
Paglingkuran lahat kayo
Buong husay, buong ingat
Sa lahat ng oras
Gamit ang Agham at Teknolohiya
Patuloy na manaliksik pa
Handog twina, bagong kaalaman
Industriyang metal mapayaman
Kung kaya ko, ay kaya mo
At kaya nating lahat
Lahat ng bagay na mabigat
Kung sama-sama'y mabubuhat
Ang pag-unlad matutupad
Kung matapat ang gaganap
Ikaw, ako, tayong lahat
Isusulong ang bukas

Koro 1
Kaya ko, kaya mo, kaya nating lahat
Industriya ay tutulungan, pribado o gobyerno man
MIRDC ang Sentro na magbubuklod nito
Ang tagumpay makakamit kung sama-sama tayo
Instrumental
Tungkulin ay gagampanan, kakayahan ilalaan
Tayo ay maglilingkod nang buong katapatan
Gagawin nang mabilis, lahat sa tamang paraan
At ating mararating tagumpay na inaasam
(Ulitin ang Koro 1)
Koro 2 (a capella)
Kaya ko, kaya mo, kaya nating lahat
Ating baya'y tutulungan, marating ang pag-unlad
Tayo ay magtulungan upang ating marating
Ang pag-unlad kung sama-sama'y kaya natin
(Ulitin ang Koro 1 at instrumental)
Kaya ko, kaya mo, kaya nating lahat

Editorial Board

Clockwise: Jo Marie Venus T. Agad, Ivy Marie P. Palma, Danilo N. Pilar *(Editor-in-Chief)* , Marlene R. Rafanan, Karen C. Santos, Lina B. Afable, Ma. Rodessa Grace A. Mercado, Zalda R. Gayahan, Marlyn U. Ramones, Fred P. Liza, Alexander P. Gonzales, Ronald L. Agustin

DEPARTMENT OF SCIENCE AND TECHNOLOGY
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