

**Department of Science and Technology  
METALS INDUSTRY RESEARCH AND DEVELOPMENT CENTER  
FY 2021 Major Projects, Programs and Activities, Beneficiaries, and Status of Implementation  
(as of September 30, 2021)**

Item No.	Title	Duration	Project Type (as source of fund)	Project Objective	Beneficiaries	Implementing Division	Status of Implementation
<b>A. AGRO-INDUSTRIAL MACHINERY</b>							
1	Establishment of the Advanced Mechatronics, Robotics and Industrial Automation Laboratory (AMERIAL) in Support of the Metals and Engineering Industries	01-Jan-19 to 31-Dec-21	GIA	The AMERIAL is envisioned to create a pool of skilled and highly qualified workforce, and to become an accredited training and development facility in industrial automation. Through its service offerings such as the conduct of training programs, development of automation applications, promotion of research collaborations, and automation development for the MSMEs, the AMERIAL also aims to increase the manufacturing industry's productivity and raise the country's awareness of Industry 4.0 and its benefits.	Metals and Engineering Industry	PD	<ol style="list-style-type: none"> <li>1. Continuation of Assessment activities for the automation of processes of MSMEs</li> <li>2. Development of training curriculum with TESDA</li> <li>3. Continuation of R&amp;D activities for dialysis machine and IOT for CNC machines of MIRDC</li> <li>4. STARTUP activities for system integrators</li> </ol>
2	Research on Advance Prototyping for Product Innovation and Development Using Additive Manufacturing Technology (RAPPID ADMATEC)	01-Jan-19 to 31-Dec-21	GIA	The project aims to increase the country's technical readiness, business sophistication, and innovation ratings by introducing one of the emerging (disruptive) technologies which is the Additive Manufacturing or AM. The project is foreseen to greatly contribute in the country's goal of becoming globally competitive and to prepare the industry and the academe for increased research and development activities, production of obsolete parts to increase availability and reliability of equipment, as well as improving manufacturing strategies and product quality. The established facility will be utilized in the research and development of products and materials while at the same time providing product development services, consultancy and training in additive manufacturing.	Metals and Engineering Industry	MPRD	<ol style="list-style-type: none"> <li>1. AMCen building inaugurated on June 14, 2021</li> <li>2. Acquired various additive manufacturing technologies</li> <li>3. Conducted Research and Development activities</li> <li>4. Developed training programs for additive manufacturing</li> <li>5. Added strategies for the operation and sustainability of RAPPID-ADMATEC and AMCen facility</li> </ol>
3	Development of Automatic Trash Rake (ATR) for Malabon	01-Feb-18 to 30-Nov-19 Extension 1: 1-Dec-19 to 31-March-20 Extension 2: 1-April-20 to 30-Sept-20 Extension 3: 1-October-20 to 31-Dec-20 Extension 4: 1-Jan-21 to 30-June-21 Extension 5: 1-July-21 to 31-Dec-21	GIA	The project aims to install/establish ATR which is designed as an alternative measure to improve flood control operation through better trash collection rate with a capability to lift large-sized trash along the creek and de-clog drainage systems, along MaNaTuTi River System.	Malabon LGU	PD	<ol style="list-style-type: none"> <li>1. Machined/fabricated chain links were delivered to the site;</li> <li>2. On-going assembly of the chain links;</li> <li>3. On-going machining of rollers</li> </ol>

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4	Design and Development of Smart Deployable Food Hub	01-Nov-19 to 31-Jul-20 Extension 1: 1-Aug-20 to 30-Oct-20 Extension 2: 1-Nov-20 to 31-Dec-20 Extension 3: 1-Jan-21 to 30-June-21 Extension 4: 1-July-21 to 30-Sept-21	GIA	The project aims to address the perennial problem of MSMEs in the food industry which is the inability to comply with the regulatory agency's requirements on food processing facility by developing a low cost and FDA approved Smart Deployable Food Hub.	DOST-Region IV MSMEs	PD	1. The Food Hub was deployed in August at Magallanes, Cavite. Commissioning of the kitchen appliances ( coffee roaster, coffee grinder, burner, ACU and refrigerator) were conducted at the deployment site.  2. Participated in the "Blessing and Ribbon Cutting Activities" facilitated by DOST IV-A. Set-up and preparation of the Food Hub prior the event were handled by the project team.
5	Refining Laterite-based Crude Pig Iron for Specific Product Applications	01-Apr-21 to 31-March-23	GIA	The project is primarily aimed at establishing the feasibility of increasing the value-added of Philippine ores - that additional processes should be conducted in the Philippines instead of directly shipping them abroad or partially processing them. Higher value adding of Philippine ores and minerals means more revenue for the country and additional employment opportunities for the Filipinos.	Metals and Engineering Industry	MPRD	1. Ongoing acquisition of supplies and materials for the project 2. Ongoing design of the lab-scale crude pig iron refining equipment 3. Started fabrication of some components of the lab-scale crude refining equipment for desulfurization and dephosphorization. 4. Experienced delays in acquisition of machine components and machine development due to changes in the procurement system
6	Rapid Prototyping of Cube Satellites Parts	28-Jan-21 to 28-Jan-22	Joint Research	A joint research project with the University of the Philippines that aims to develop fully-functional cube satellites parts, with complex geometries, through additive manufacturing to sustain satellite technology development through rapid prototyping and design optimization.	Metals and Engineering Industry	MPRD	1. Printed and post-processed the cube satellite frame in aluminum 2. Printed the CubeSat camera baffles 3. Printed wire-cutting mechanism components in PEEK polymers 4. Created a mandrel for fabrication of antenna 5. Ongoing iteration and printing of camera baffles and deployment mechanisms. 6. Functional tests being done on parts by partner 7. Dimension measurements of Printed Cubesat Frame using CMM 8. Ongoing optimization of Cubesat frame 9. 3D printed some metal components

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7	Effect of Machining Parameters on the Mechanical Properties of AISI 4340 Materials	01-Jan-21 to 30-Nov-21	Internal Project	The project aims to investigate the possible effects of lathe machining to the mechanical properties of AISI 4340 material using different parameters.	Metals and Engineering Industry	ATD	<ol style="list-style-type: none"> <li>1. Purchasing of Materials – Completed</li> <li>2. Machining of Samples – Completed 31 Aug. 2021</li> <li>3. Material Characterization               <ol style="list-style-type: none"> <li>3.1 Chem Analysis – completed</li> <li>3.2 Knoop Hardness – completed</li> <li>3.3 Tension Test - completed</li> <li>3.4 Metallography on roughing parameter – completed</li> <li>3.5 Metallography on finishing parameter – on-going</li> </ol> </li> <li>4. Analysis of Data – on-going</li> </ol>
8	Rapid Prototyping of an Enclosure for a Large Surveillance Camera System	01-May-21 to 31-July-21 Extension 1 1-Aug-21 to 31-Dec-21	Internal Project	The project aims to design and develop a functional prototype for an enclosure for Project BUHAWI's optical system using additive manufacturing technologies. The project is an Internal R&D funded by the AMCEN and BUHAWI project.	Metals and Engineering Industry	MPRD	<ol style="list-style-type: none"> <li>1. Changes on the design to be printed</li> <li>2. Ongoing modifications on the design to be 3D printable</li> <li>3. Test fitting of available 3D printed parts</li> <li>4. Finished 3D printing of parts</li> </ol>
9	A Pilot Application of IoT for Machine Shop Monitoring System of MIRDC	01-Aug-21 to 31-Mar-22	Internal Project	This pilot project aims to provide the industry a locally developed machine shop monitoring system that will become a stepping stone for them towards Industry 4.0. This project is proposed to adapt and promote the use of Industry 4.0 technologies in the local industry to ensure efficient and accurate monitoring of selected equipment and machine shop operations, thus, optimizing shop capacity and increasing customer satisfaction.	Metals and Engineering Industry	PD	<ol style="list-style-type: none"> <li>1. Accomplished bill of materials</li> <li>2. Accomplished design and electrical drawings</li> <li>3. Programming for machine monitoring system – on-going</li> <li>4. Procurement of materials on-going</li> </ol>
10	Cu/Ni-P Plating on Additively Manufactured Polyetherimide (PEI) with Heat Treatment for High Electromagnetic Radiation Shielding Effectiveness	01-Aug-21 to 31-Dec-21	Internal Project	This project will apply the Copper and Nickel plating to various appropriate additively polymer to improve its electromagnetic interference and radiation shielding.	Metals and Engineering Industry	MPRD	<ol style="list-style-type: none"> <li>1. Successfully 3D printed ABS polymer test specimens</li> <li>2. Successfully converted the surface of 3D printed ABS polymer to a conductive surface</li> <li>3. Successfully electroplated Cu and Ni to the surface of 3D printed ABS</li> <li>4. Conducted preliminary moisture tests: plating protection property of plating preventing distortion of samples</li> <li>5. Conducted radiation testing: beta and gamma rays</li> </ol>

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11	Design and Development of Metal Injection Mold for GI HAMMER	01-Dec-18 to 30-June-19 Extension 1: 1-Jul-19 to 31-Dec-19 Extension 2: 1-Jan-2020 to 31-Dec-20 Extension 3: until end of September 21 Extension 4: 1-October-21 to 30-November-21	Contract Research Project	This is a contract research project with Precision Foundry of the Philippines Inc. that aims to design and develop a metal injection mold set for GI HAMMER part.	Metals and Engineering Industry	PD	1. Results of actual testing made on August 13, 2021 requires more machining repair works on the mold.  2. Requested for project extension until Nov. 30, 2021.
12	Optimization of MPEW Cast Iron and Non-Ferrous Melting Process and Equipment for Enhanced Energy and Output Efficiency	01-Sep-19 to 31-Aug-20 Extension 1: 01-Sep-20 to 31-Dec-20 Extension 2: 01-Jan-21 to 31-March-21 Extension 3: 01-April-21 to 30-Sept-21 Extension 4: 01-Oct-21 to 31-Dec-21	Contract Research Project	The project is a contract research with Metallic Pisces Engineering Works (MPEW) that aims to improve the company's process of melting cast iron and non-ferrous metals.	Metals and Engineering Industry	MPRD	1. Completed assessment of melting furnaces (crucible and cupola) 2. Completed improvements and modification of crucible and cupola furnaces 3. Submitted the required furnace modifications to MPEW. MPEW has accomplished a portion of the recommended modifications
13	Development of Local Electric Kick Scooters (LEKS)	01-March-21 to 28-Feb-22	Contract Research Project	The project aims to develop a prototype local electric kick scooter with locally developed security features and dynamic power adjustment which can serve as an alternative means of transportation during the new normal and post new normal periods.	Metals and Engineering Industry	PD	1. Simulations on various designs of the mid part of LEKS 2. Generated material list for parts for fabrication 3. Generated current design 4. Ongoing casting drawing creation
14	Prototype Development of Enclosure for Embedded Acoustic Recognition Sensors (EARS)	01-May-21 to 31-Jan-22	Contract Research Project	The project aims to develop a robust motor frequency acoustic sensor enclosure for ONEWATT LABS CORPORATION and accelerate product prototyping time and development through additive manufacturing.	Metals and Engineering Industry	MPRD	1. Performed simulations on the current design of EARS 2. Identified material and mounting solutions 3. Designed mounting attachments for EARS 4. Test print of current design 5. Generated test protocol 6. Ongoing design revision of EARS

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15	Prototype Development of Enclosure for Lightweight Observer Bluetooth Emitter (LOBE)	01-May-21 to 31-Oct-21	Contract Research Project	The project aims to develop a robust motor frequency vibration sensor enclosure for ONEWATT LABS CORP. and accelerate product prototyping time and development through additive manufacturing.	Metals and Engineering Industry	MPRD	<ol style="list-style-type: none"> <li>1. Performed simulations on the current design of LOBE</li> <li>2. Identified material and mounting solutions</li> <li>3. Designed mounting attachments for LOBE</li> <li>4. Test print of initial design</li> <li>5. Ongoing design revisions for LOBE</li> <li>6. Generated test protocol</li> </ol>
<b>B. DEFENSE AND SECURITY</b>							
1	Building a Universal-Mount for Heavy Barrel Automated Weapon Integration (BUHAWI) - Automated Gun Mount for Browning 0.50 Caliber Machine Gun, M2, Heavy Barrel	15-Dec-18 to 14-Dec-20 Extension 1: 15-Dec-20 to 14-June-21 Extension 2: 01-July-21 to 31-Dec-21	GIA	The project generally aims to improve the firepower capability of the Philippine Navy's floating assets through the design and development of an automated gun mount for Browning 0.50 Caliber Machine Gun, M2 (Heavy Barrel).	Armed Forces of the Philippines	PD	<ol style="list-style-type: none"> <li>1. Land Based Live Fire Testing of BUHAWI prototype on Aug. 24 and Sep. 13, 2021.</li> </ol>
<b>C. HEALTH</b>							
1	Rapid Prototyping of Nasal Mask for Neonatal Ventilation	01-May-21 to 31-Oct-21	Joint Research	The project aims to locally develop a functional nasal mask prototype through additive manufacturing that can be used for the ventilation of neonatal patients in public hospitals in the Philippines.	Metals and Engineering Industry Health Sector	MPRD	<ol style="list-style-type: none"> <li>1. Generated 2nd iteration of design</li> <li>2. Material research</li> <li>3. Mold design of nasal mask</li> <li>4. Printed 1st and 2nd design of the mold</li> <li>5. Test molding using the 2nd design print out</li> <li>6. Generated 3rd design</li> <li>7. Printed 3rd design</li> <li>8. Initial review of nasal mask from partner</li> <li>9. Ongoing revisions based on review</li> </ol>
2	Development of Locum Artificial Body for Radiation Analysis and Testing (LAB-RAT)	01-Aug-21 to 31-July-21	Joint Research	This project aims to design and fabricate mouse models for use in radiation research. Specific objectives includes the development of two (2) whole-body mouse models with x-ray radiation properties close to that of an actual live mouse; and evaluation of the fabricated mouse phantoms in terms of x-ray radiation properties.	Metals and Engineering Industry	MPRD	<ol style="list-style-type: none"> <li>1. Materials identified</li> <li>2. Methodology designed</li> <li>3. CAD modelling of the parts</li> <li>4. Test-print the mouse skin mold</li> <li>5. RFA signed and notarized(August 2021)</li> <li>6. Conducted technical meeting with PNRI for testing of phantoms</li> </ol>

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3	Development of a Local Hemodialysis Machine	1-Jan-21 to 31-Dec-21	Internal Project	The project aims to develop a prototype localized dialysis machine. This project entails robotics and automation work as part of the AMERIAL project.	Metals and Engineering Industry Health Sector	PD	1. Fabricated materials- housing of localized dialysis machine peristaltic rod, peristaltic roller, and HMI mounting 2. On-going 3D printing of pump wall and heparin pump mechanism
4	Characterization of Intramedullary Nails Used in the Philippines Through Mechanical and Chemical Properties Determination	01-Aug-21 to 31-Oct-21	Contract Research Project	The general objective of the project is to have an analysis on antibiotic nails to support the study on temporary fixation during early stage of infected bone fracture by subjecting it to external forces and compare its behavior to the conventionally used intramedullary nails. The study will characterize the three types of intramedullary nails used in femoral and tibial fractures by determining their mechanical and chemical properties.	Metals and Engineering Industry Health Sector	ATD	1. Conducted Research / Review of test method on testing of IM Nails 2. Finalized requirements on test set up 3. Completed preparation of materials for the test fixtures 4. Designed and fabricated test fixtures 5. Accomplished sample preparation 6. Conducted Bend Testing, XRF, Fatigue / Cyclic, Corrosion 7. Ongoing – Analysis of data / results 8. Ongoing – Preparation of Terminal Report
<b>D. MASS TRANSPORT SYSTEM</b>							
1	Technical Support and Evaluation of the Hybrid Electric Train Operation	19-Aug-20 to 18-Aug-21 Extension 1 19-Aug-21 to 03-Jan-22	GIA	The project aims to provide technical support to PNR for one (1) year from the start of the HET operation as a revenue train. It also aims to conduct studies that includes: ridership study to establish a revenue model and an actual operational cost for the train; and parametric optimization of the load-sharing mechanism to maximize energy efficiency of HET.	Metals and Engineering Industry Riding public	PD	The HET project team requested PNR for the approval of the resumption of the HET's Validation Testing this October 15, 2021. Proposed testing is from Calamba to IRRI due to a damaged bridge in San Pedro, Laguna.
<b>E. CAPABILITY BUILDING</b>							
1	Advancement of Information and Communications Technology (ICT) and Implementation of Information Security Management System (ISMS) in MIRDC – (AIM) - Year 1	01-Jan-21 to 31-Dec-21	DGIA	The project aims to provide the Center's with innovative and secured S&T services thru ICT and improved information security management capability by ensuring compliance to international and local information security laws and other related policies/agreements, implementation of ISO/IEC 27001 certification standard and establishing highly reliable backup system and appropriate business continuity plan for the Center's main operations.	MIRDC	PMD	Overall, the ICT-AIM contributes to the ICT Infrastructure upgrading that supports the capability of the Center to provide its employees ICT-enabled tools for continuous public services during global pandemic  Major Accomplishments: 1. Implementation of Server Replication (to support the public service continuity) 2. Internet Service Redundant Solution (to support work-from-home or teleworkers of the MIRDC)

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2	Establishment of a Mold Technology Support Center (MTSC) -Year 2	01-Aug-20 to 31-July-23	GIA	The MTSC is an Official Development Assistance (ODA) initiative of the Republic of Korea specifically tailored for the Philippine Die and Mold industry. The MTSC will be established in Cavite Economic Zone (CEZ) to develop the most needed human resources for the local die and mold companies, encourage the advancement of the Philippine manufacturing industry's competitiveness and contribute to the industrial cooperation between the Republic of Korea and Republic of the Philippines.	Metals and Engineering Industry	DED-RD / TDD	Total MTSC Trainees for 2021 Q1, Q2 and Q3 of 2021 (Local MTSC Trainers) 1,174 Q1, Q2 and Q3 of 2021 (Foreign MTSC Trainers) 478 Total 1,652  Ongoing construction of MTSC Building
3	Establishment of Metals and Engineering Innovation Centers in Cordillera Administrative Region (CAR), Regions I, II, III and X - Year 2	01-Aug-20 to 31-July-22	GIA	<p>This project is in connection with MIRDC's desire to be present in the regions to be more responsive to the needs of the metals, engineering and allied industry nationwide. Sec. Fortunato De la Peña of DOST planned to put up different kinds of innovation centers, wherein the innovation center for metals and engineering will be centered around MIRDC.</p> <p>These innovation centers shall serve as venue for the conduct of research studies for the development of new innovative metal parts and components, products, machineries, and other services in collaboration with the academe and industry. It is also envisioned to offer practical solutions to pressing metals and engineering problems encountered in the community or in the region.</p>	Metals and Engineering Industry	DED-RD / TDD	Attendees to the Training Programs  CNC Milling Programming & Operation - Sept. 15 & 16, 2021 (39 attendees) Heat Treatment of Steels - Sept. 23, 2021 (28 attendees) Foundry Introduction & Casting Design - Sept. 27, 2021 (24 attendees) Foundry Patternmaking- Sept. 28, 2021 (26 attendees) Molding Sand Properties & Control- Sept. 29, 2021(24 attendees) Foundry Melting and Casting Defects & Remedies- Sept. 30, 2021 (23 attendees)
4	Towards Leveling-Up Onelab for Research and Innovation	01-Feb-21 to 31-Jan-22	GIA	The project aims to enhance the capabilities of DOST laboratories to provide higher level of service offerings and better support the needs of the MSMEs. Specific Objectives: The project specifically aims to: 1. Level-up laboratory services through provision of shop floor R&D and innovation activities 2. Sustain delivery of laboratory services backed-up with secured IT-based laboratory information management system 3. Strengthen the Onelab network through robust referral system 4. Draw up sustainability options and future direction of DOST laboratories	Metals and Engineering Industry	ATD	1. Identified three (3) R& D on-going activities  2. Two (2) R& D related trainings via web were attended by three (3) ATD staff last March and May 2021. 100% of the target for trainings were accomplished  3. Physical targets of all indicators were attained  4. The One-Lab project submitted its 5-year Roadmap as extracted from the MIRDC 10-year Strategic Plan, needed for the crafting of the 5 year One-Lab project proposal.

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<b>F. GAA-LFP PROJECTS = 3</b>							
1	Upgrading of MIRDC Laboratory and Administrative Building	01-Jan-18 to 31-Dec-21	GAA-LFP	To extend the useful life of the ATD Building and ensure long term safety, reliability and strengthen its seismic resistance required for modern buildings.	MIRDC	FAD	Upgrading of MIRDC Laboratory and Administrative Building 2020-LVSG Ph. I - 97.80%  2021-LVSG Ph. II - 64.50%
2	Repair of Perimeter Fence of the Center	01-Jan-18 to 31-Dec-21	GAA-LFP	Repair will upgrade the existing perimeter fence with deteriorated steel fences and collapsing concrete walls in view of wear and tear.	MIRDC	FAD	Fire Pro. Ph. II - 95.27% 1. Structural works: 1.1 Rebar works and concrete pouring of Copper Building Cistern Tank. 1.2 Rebar works and concrete pouring of Gold Building Cistern Tank. 1.3 Rebar works and concrete pouring of Steel Building Cistern Tank.
3	Construction of New Cistern Tank and Upgrading of Center's Water Supply	01-Jan-18 to 31-Dec-20	GAA-LFP	The construction of a new cistern tank will serve as an additional reservoir to meet the increasing water demand of the Center. Also, the existing overhead tank of the Center requires integrity check-up and rehabilitation, Rain catchment tanks will also be installed as additional source of water supply. Due to wear and tear conditions of water and sanitary lines, replacement and rehabilitation is recommended. Fire hydrants in each building will be installed.	MIRDC	FAD	Retaining Wall Ph. IV - 94.08%

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