# **Metals & engineering SECTOR**

World-class Engineered Metal Products and Services, a Pillar to Manufacturing Industries' Progress and Competitiveness

Pandaigdigang Pamantayan ng De-kalidad na Serbisyo at Produktong Metal: Sandalan ng Progresibo at Mahusay na Industriya ng Paggawa



Republic of the Philippines DEPARTMENT OF SCIENCE AND TECHNOLOGY PHILIPPINE COUNCIL FOR INDUSTRY, ENERGY AND EMERGING TECHNOLOGY RESEARCH AND DEVELOPMEN'

**OneDOST4U** 



### d Cabri Metals and Engineering Sector: Machinin cation

### Updated as of 26 February 2024

opualed as of 201 e	•	R&D	<b>P18.4M&gt;</b> • Establishments of Regional
<ul> <li>Overall Strategies</li> <li>Human Recourse</li> <li>Training on CNC Machine programming, mechanical design, fabrication (e.g.gear)</li> <li>Training Centers for Metal Stamping and hydraulic press</li> <li>Basic TIG Welding and Advance Welding, SMAW,MIG and other Welding</li> <li>PLC Applications, Material Selection</li> <li>Training in automation and controls/electronics (e.g.multi- purpose grinder machine)</li> <li>Basic Metrology and 3D Modeling Software</li> <li>Repair and Maintenance of Equipment</li> <li>QMS for Fabrication of Machines</li> <li>Certification of machine shop for aerospace industry</li> </ul>	<ul> <li>Facilities / Services</li> <li>Upgraded Facility for Machining and Fabrication</li> <li>Upgraded 3D Printing Technology Facility for Aerospace, jigs and fixtures</li> <li>Testing Facility /Services: <ul> <li>Chemical Testing for Metals</li> <li>NDT, Toxicity and Flammability</li> <li>Coil testing and Aging Test</li> <li>Material testing and quality</li> <li>Infrared Spectrum Test</li> <li>Elemental Analysis: e.g EDX</li> <li>Failure/ endurance analysis test</li> </ul> </li> <li>Standard reference on mechanical design and fabrication of different machineries intended for Agri-industry and other metal related equipment</li> <li>Standard reference on material selection</li> </ul>	Mechanical Garlic & Cashew Chipper • Development of a Liner- Enhanced Curing Vessel for	<ul> <li>Innovation Centers in Regions CAR, I, II, III, and X</li> <li>Establishments of Regional Innovation Centers in Regions IVA, IVB, V, VI, VII, IX, X, XI, XII and CARAGA</li> <li>Establishment of Upgraded Meter Testing Center Applicable to the Needs of the Metal Industry</li> <li>R&amp;D Application on Robotics an Mechatronics for shop automatio</li> <li>Design and Prototyping of Salt Harvesting Equipment</li> <li>Development of a Liner- Enhanced Curing Vessel for Salted Egg Production of Eggciting Traditions</li> <li>Design Improvement &amp; Sea testing of a Remote Controlled Weapon System</li> <li>Capability Building for Certification for Aerospace Standards</li> </ul>
<ul> <li>R&amp;D Technologies</li> <li>Design and Development of innovative, cost-effective equipment</li> <li>Integrated R&amp;D Centers</li> <li>Establishment/Development of Primary/Secondary Traceability Standards in Support to Metals Industry</li> <li>Support technologies to Aerospace Industries</li> <li>R&amp;D Application on robotics and mechatronics for shop automation</li> <li>Facilities / Services</li> <li>Regional Innovation Centers in Regions CAR, I, II, III,IVA,IVB,V,VI,VII,VIII, IX,X,XI,XII</li> <li>Training Center for Automation and Controls</li> <li>Metal Testing Center (e.g.Tensile, Compression, Hardness)</li> </ul>	< P25.6M> • Establishments of Regional Innovation Centers in Regions CAR, I, II, III, and X • Design and Prototyping of Satt Harvesting Equipment • Design & Development of a Mechanical Garlic & Cashew Chipper • Development of De-Oiling Equipment for Deep Fired Peanuts & Garlic Chips People: at least 2 skilled equipment designer Product: 2 Locally-fabricated equipment Places: 2 Innovation Center for fabrication of and Industrial Equipment	2020 Agri Agri	ce     for Aerospace       killed equipment     Product:       • at least 6 fabr       • at least 6 fabr       • At least 2 Lood       • Standards       • cally- fabricated       • at least 1 aute       • process appli       • Product:       • at least 1 aute       • process appli       • Places:       Center for       Agri and

hining	g and I	Fa	briçati	on
		•	Establishments of Centers in Regions	Regional Innovation
Establishment Innovation Cer CAR, I, II, III, II, E Establishment Innovation Cer IVA, IVB, V, V and CARAGA Establishment Testing Center Needs of the M R&D Application	nters in Regions and X s of Regional nters in Regions I, VII, IX, X, XI, XII of Upgraded Metal r Applicable to the Metal Industry on on Robotics and	•	Centers in Regions VII, IX, X, XI, XII ar Establishment of U Testing Center App Needs of the Metal R&D Application or Mechatronics for sl Design and Develo Technology-Based Aerospace Applica Recovery & Reuse	VA, IVB, V, VI, and CARAGA (pgraded Metal licable to the I Industry n Robotics and hop automation upment of Products for
		•	Aerospace Standar	for Certification for rds
Enhanced Cur Salted Egg Pr Eggciting Trad Design Improv testing of a Re	oduction of litions		Legal Metrology Subsonic Wind Tur ASIN Project 1 ASIN Project 2 OneLab for TED	nnel Project
Weapon Syste Capability Buil Certification fo Standards	ding for r Aerospace	2(	)22	People: • at least 15 skill equipment mai • at least 1 skille automation and Programmers • at least 6 person
202 ined fabrication nt	and equipment r at least 1 skilled Applications, aut controls/electron Programmers at least 4 skilled at least 4 trained	persor tomatio tics, me equipn d perso	anel on PLC on and echatronics, CNC nent designer nnel for certification	<ul> <li>at least 2 skille</li> <li>development</li> <li>at least 4 skille</li> <li>at least 4 skille</li> <li>at least 4 traine</li> <li>Aerospace Sta</li> <li>4 NML staff tra</li> <li>Product:</li> <li>at least 6 fabric</li> <li>at least 1 autor</li> </ul>
led equipment ned personnel on for tandards Ily- fabricated	essential oils and etc.) • at least 1 automa process applicat	ated equ y-fabric sing ind d fragra ated eq	uipment	<ul> <li>application</li> <li>at least 2 produces</li> <li>At least 2 Loca processing indufragrances, aer</li> <li>15 units equipmediates</li> <li>5 Innovation Comparison</li> </ul>
enter for gri and	Places: 5 Innovation Cer and Industrial Ec	quipme	nt	<ul> <li>2 calibration ro Equipmentovat</li> <li>Patent:</li> </ul>

- plication on Robotics and ronics for shop automation and Development of logy-Based Products for ace Applications rv & Reuse of Abrasive Grains COBRA oject ity Building for Certification for ace Standards letrology ic Wind Tunnel Project
  - roject 1 roject 2 for TED

### People:

- at least 15 skilled nel on fabrication and equipment maintenance at least 1 skilled personnel on PLC Applications. automation and controls/electronics, mechatronics, CNC Programmers
- at least 6 personnel trained on metal testing equipment
- at least 2 skilled personnel on aerospace product development prication
  - at least 4 skilled equipment designer
  - · at least 4 trained personnel for certification for
  - Aerospace Standards 4 NML staff trainees

### Product:

ner at least 6 fabricated equipment tification at least 1 automated equipment for shop process

application at least 2 products developed

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Partnership:

At least 2 Locally-fabricated equipment (e.g.food

UM of the fabricated equipment

at least 1 company/institution per regio

- processing industry, Agri-industry, essential oils and fragrances, aerospace, etc.) 15 units equipment & standards
- Places:
- shop 5 Innovation Center for Fabrication of · 2 calibration rooms renAgri and Industrial Equipmentovated
- of Aari
- or Metal Testing
- icated equipment

### < P236.92M>

- · Establishments of Regional Innovation Centers in Regions IVA, IVB, V, VI, VII, IX, X, XI, XII and CARAGA
- R&D Application on Robotics and Mechatronics for shop automation
- Design and Development of Technology-Based Products for Aerospace Applications
- Establishment of Micro Machining Facility
- Capability Building for Certification for Aerospace Standards
- Expanding the Capability of Physical Metrology
- Legal Metrology
- Subsonic Wind Tunnel Project
- ASIN Project 1 ASIN Project 2
- Project COBRA
- · Subsonic Wind Tunnel Project
- OneLab for TED

# 2023

 20 skilled faculty staff on design and fabrication of equipment

People:

 At least 118 trained personnel on different areas in metrology

2024

- 5 personnel from the partner industry 2-3 graduate/undergraduate involvement
- for grinding wheel processing At least 5 personnel employed with ASIN
- Project researcher 234 personnel trained (OneLab services)
- · 67 subject matter experts
- 157 approved/recognized signatories
- (OneLab services)
- 1 training program granting CPD units
- 11 R&D services conducted Products:
- 2 fabricated Coffee Drip Machine
- 1 fabricated Wind Tunnel
- 1 fabricated Spinning Disc
- 1 Fabricated Gun-Mount
- · 2 fabricated recovered grinding wheel
- 1 Municipal and Provincial Suitability map
- of Saltern Farms 1 training resource material for Calibration
- of Anemometers 1 interlaboratory comparison for Calibration
- of Anemometers Calibration service for Anemometers



Completed

Outcomes

### Human Recourse

· At least 50 personnel on fabrication and equipment maintenance at least 18 skilled

Target

- equipment designer at least 20 trained personnel for certification
- Aerospace Standards for Aerospace Standards · Expanding the Capabilities of Physica

New/

Ongoing

Legend

(Text Font):

IX, X, XI, XII and CARAGA

Facility

aerospace, etc.)

Metrology

Establishment of Micro Machining

< P271.3M>

Centers in Regions IVA, IVB, V, VI, VII,

Design and Development of innovative.

(e.g. food processing industry, Agri-

Capability Building for Certification for

People

26 approved/recognized

production technologies

At least 1 salt producer

academe related to salt.

At least 1 employed staff

personnel in the laboratory.

At least 20 processors trained on

staff trained in GIS suitability

mapping, saltern design and

At least 5 personnel employed

Milestones

At least 2 trained

association

in the project

establishment

employment

signatories (OneLab services)

personnel/researchers on salt

Conducted at least 2 seminars to

industry, essential oils and fragrances,

cost effective and appropriate Machinery,

Parts and Engineered Products (MPEPs)

· Establishments of Regional Innovation

- at least 2 skilled 2025 personnel on PLC Applications, automation
  - and controls/electronics. mechatronics, CNC Programmers
    - at least 4 skilled personnel on aerospace product development at least 6 trained on metal testing
    - At least 8 skilled micro machinist

### salt farmers, region1 LGUs, and **R&D** Technologies

- At least 46 locally fabricated equipment 4 products developed for aerospace
- salt production and maintenance 2 automated equipment post production and handling. At least 5 MS students engaged

### Facilities / Services

- 14 established At least 50 students and 20 LGU Innovation Center
  - 2 Metal Testing Facilities at least 10 established
  - services
- 2 micro-machining 20 trained personnel on facilities Equipment design and fabrication
  - S&T Policies 2 S&T policies



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- Industry · Support technol
- Aerospace Indu R&D Application mechatronics fo
- Facilities / Service

- Regional Innova Regions CAR, I III,IVA,IVB,V,VI,
- IX,X,XI,XII
- and Controls
- Metal Testing C
- (e.g.Tensile, Co

- Training Center
- Hardness)

# Metals and Engineering Sector: Machining and Fabrication

Updated as of 26 February 2024

### **Overall Strategies**

### Human Recourse · Training on CNC Machine

- programming, mechanical design, fabrication (e.g.gear)
- Training Centers for Metal Stamping and hydraulic press
- · Basic TIG Welding and Advance Welding,SMAW,MIG and other Weldina PLC Applications, Material
- Selection Training in automation and controls/electronics (e.g.multi-

purpose grinder machine)

- Basic Metrology and 3D Modeling Software · Repair and Maintenance of
- Equipment QMS for Fabrication of Machines
- Certification of machine shop for aerospace industry

### **R&D** Technologies

- · Design and Development of innovative, cost-effective equipment Integrated R&D Centers
- Establishment/Development of Primary/Secondary Traceability Standards in Support to Metals Industry
- · Support technologies to Aerospace Industries
- R&D Application on robotics and mechatronics for shop automation

### Facilities / Services

- Regional Innovation Centers in Regions CAR, I. II. III,IVA,IVB,V,VI,VII,VIII, IX,X,XI,XII
- · Training Center for Automation and Controls
- · Metal Testing Center (e.g.Tensile, Compression, Hardness)

# Fabrication

- Facility for Aerospace, jigs and fixtures Testing Facility /Services: - Chemical Testing for Metals
  - -Material testing and quality -Infrared Spectrum Test

### - Elemental Analysis: e.g EDX - Failure/ endurance analysis test

### S&T Policies

Standard reference on mechanical design and fabrication of different machineries intended for Agriindustry and other metal related equipment

Standard reference on material selection

### < P25.6M> · Establishments of Regional

Innovation Centers in Regions CAR. I. II. III. and X Design and Prototyping of Salt Harvesting Equipment

- Mechanical Garlic & Cashew Chipper Development of De-Oiling
- Equipment for Deep Fired

# People:

Product: 2 Locally-fabricated equipment Places: 2 Innovation Center for fabrication of Agri and Industrial Equipment

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Republic of the Philippines

### Facilities / Services Upgraded Facility for Machining and Upgraded 3D Printing Technology

-NDT, Toxicity and Flammability -Coil testing and Aging Test

### < P38.01M> Establishments of Regional

- Innovation Centers in Regions CAR, I, II, and X
- Design and Prototyping of
- Salt Harvesting Equipment

## Capability Building for

Certification for Aerospace Standards

Design & Development of a Mechanical Garlic & Cashew

### Chipper · Development of a Liner-Enhanced Curing Vessel for Salted Egg Production of

- Eggciting Traditions Development of De-Oiling Equipment for Deep Fired
- Peanuts & Garlic Chips

People:

maintenance

Standards

Product:

equipment

Places:

at least 10 trained personnel on

fabrication and equipment

At least 4 Locally-fabricated

UM of fabricated equipment

- · Design & Development of a

Peanuts & Garlic Chips

at least 2 skilled equipment designer

2 Innovation Center for fabrication of Agri and Industrial Equipment Patent:

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**R&D Solution** 

### < P18.4M> · Establishments of Regional Innovation Centers in Regions CAR, I, II, III, and X

 Establishments of Regional Innovation Centers in Regions IVA, IVB, V, VI, VII, IX, X, XI, XII and CARAGA · Establishment of Upgraded Metal

### Testing Center Applicable to the Needs of the Metal Industry R&D Application on Robotics and

- Mechatronics for shop automation · Design and Prototyping of Salt
- Harvesting Equipment Development of a Liner-Enhanced
- Curing Vessel for Salted Egg Production of Eggciting Traditions
- · Design Improvement & Sea testing of a Remote Controlled Weapon System Capability Building for Certification for
- Aerospace Standards

# 2022

- People skilled personnel on and equpiment maintenance at least 1 skilled personnel on PLC 202 Applications, automation and
  - controls/electronics, mechatronics, CNC Programmers at least 4 skilled equipment designer
  - at least 4 trained personnel for certification for Aerospace Standards

### Product:

- at least 6 fabricated equipment at least 4 skilled equipment designer At least 2 Locally-fabricated equipment at least 4 trained personnel for (e.g.food processing industry, Agricertification for Aerospace industry, essential oils and fragrances, aerospace, etc.)
  - · at least 1 automated equipment for shop process application

### Places:

- 5 Innovation Center for Fabrication of Agri and Industrial Equipment
- · 2 facilities for Metal Testing
- Patent: UM of the fabricated equipment

### < P858.72M>

- · Establishments of Regional Innovation Centers in Regions CAR, I, II, and X
- · Establishments of Regional Innovation Centers in Regions IVA, IVB, V, VI, VII, IX, X, XI, XII and CARAGA
- Establishment of Upgraded Metal Testing Center Applicable to the Needs of the Metal Industry R&D Application on Robotics and Mechatronics for
- · Capability Building for Certification for shop automation Expanding the Capability of Physical Metrology

Legend

(Text Font):

X. XI. XII and CARAGA

Aerospace Standards

Metrology

2024

4 Papers published and/or presented in

national and/or international conferences

• 2 Papers on any of the following: (1) grinding

wheel recycling (2) materials recovery, or (3)

1 Publication and technical paper for Airspeed

Performance Evaluation of Coffee Drip

· 1 Research Paper on Economic Impact of

• 4 Copyright on Training Modules, one (2) for

• 1 UM and copyright of manual for gun-mount

copyright Operational Manual for Coffee Drip

• 1 Established ASIN R&D Center (Membrane

Science and Separation Technology Facility,

with

loca

NAWI and one (2) for Fuel Dispensers (for

• 1 Research Paper on Design and

abrasive recovery and reuse in grinding wheel

< P236.92M>

Establishments of Regional Innovation Centers

in Regions IVA, IVB, V, VI, VII, IX, X, XI, XII

R&D Application on Robotics and Mechatronics

Design and Development of Technology-Based

Products for Aerospace Applications

Establishment of Micro Machining Facility

Publications

applications

Calibration

Machine

Machine

Salt and

Places

Patent

Coffee Drip Machine

LGUs and LGUs

1 UM Coffee Drip Machine

Established partnerships

stakeholders and researhers

and CARAGA

for shop automation

Aerospace Standards

Subsonic Wind Tunnel Project

Subsonic Wind Tunnel Project

Legal Metrology

ASIN Project 1

ASIN Project 2

Project COBRA

OneLab for TED

2023

el on fabrication and

New/

Ongoing

2025

1 fabricated Integrated filtration

electrodialysis method

System for Solar Salt

and lon-exchange membrane

1 fabricated Spray Pipe and Net

Method for Solar Evaporation

· 1 Document on salt production

· 1 Design of saltern farms and

menu for its best practices

1 Prototyped Primary Standard

2 New Calibration Services for

presented in national and/or

· One (1) draft PNS for NAWI and

one (1) draft PNS for Fuel

Milestones

international conferences

3 Utility Model for salt

technologies

Dispense

4 Papers published and/or

for Infusion Pump

Micro Flow

Publications

Patents

Policy

and best practices of India and

< P271.3M>

Centers in Regions IVA, IVB, V, VI, VII, IX,

Establishment of Micro Machining Facility

Design and Development of innovative, cost

effective and appropriate Machinery, Parts

and Engineered Products (MPEPs) (e.g. food

processing industry, Agri-industry, essential

oils and fragrances, aerospace, etc.)

Capability Building for Certification for

Expanding the Capabilities of Physical

Products

.Japan

· Establishments of Regional Innovation

Completed

Target

Overall

Outcomes

At least 50 personnel on

equipment maintenance

personnel for certification

for Aerospace Standards

Applications, automation

and controls/electronics,

personnel on aerospace

product development

At least 8 skilled micro

at least 6 trained on

metal testing

**R&D** Technologies

· At least 46 locally

aerospace

fabricated equipment

4 products developed for

2 automated equipment

Facilities / Services

Innovation Center

2 micro-machining

2 Metal Testing Facilities

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at least 10 established

14 established

services

facilities

S&T Policies

2 S&T policies

machinist

Human Recourse

fabrication and

at least 18 skilled

at least 20 trained

at least 2 skilled

personnel on PLC

mechatronics, CNC

Programmers

at least 4 skilled

equipment designer

- Design and Development of Technology-Based Products for Aerospace Applications · Recovery & Reuse of Abrasive Grains
- Project COBRA
- SILT Project
- Capability Building for Certification for Aerospace Standards
- Legal Metrology Subsonic Wind Tunnel Project
- ASIN Project 1
- ASIN Project 2
- OneLab for TED People:
- at least 15 skill.
  - equipment maint nce at least 1 skilled personnel on PLC Applications. automation and controls/electronics, mechatronics, **CNC Programmers**
  - at least 6 personnel trained on metal testing equipment at least 2 skilled personnel on aerospace product
  - development at least 4 skilled equipment designer
  - at least 4 trained personnel for certification for

### Aerospace Standards 4 NML staff trainees

### Product:

 at least 6 fabricated equipment at least 1 automated equipment for shop process

• 5 Innovation Center for Fabrication of

2 calibration rooms renAgri and Industrial

• at least 1 company/institution per region

- application
- at least 2 products developed • At least 2 Locally-fabricated equipment (e.g.food
- processing industry, Agri-industry, essential oils and
- fragrances, aerospace, etc.) 15 units equipment & standards

Equipmentovated

UM of the fabricated equipment

linkage on aerospace industry

Places:

Patent:

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Partnership:

# Metals and Engineering Sector: Machining and Fabrication

Updated as of 26 February 2024

### **Overall Strategies**

### Human Recourse

- Training on CNC Machine programming. mechanical design, fabrication (e.g.gear)
- Metrology Trainings

### R&D Technologies

- Design and Development of innovative. costeffective equipment
- Integrated R&D Centers
- Establishment/Develop ment of Primary/Secondary **Traceability Standards**
- in Support to Metals Industry
- Support technologies to Aerospace Industries
- R&D Application on robotics and mechatronics for shop automation

### Facilities / Services S&T Service Facility for the Industry

Republic of the Philippines

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## **R&D** Solution

## < P165M>

- FASTPhils: Fabricators Assessment and Scoping in the Philippines
- Scoping for Physical Metrology (e.g., Mass, Temperature, Electrical, Fluid Flow, etc.)-
- Locally Design and Development of innovative, cost-effective, and appropriate Metal Equipment, Machine Parts and Engineered Products for various industries (e.g., food, agri, environment, creative, 2027 mining, and ship)

### < P180M>

- FASTPhils: Fabricators Assessment and Scoping in the Philippines
- Scoping for Physical Metrology (e.g., Mass, Temperature, Electrical, Fluid Flow, etc.)-
- Locally Design and Development of innovative, cost-effective, and appropriate Metal Equipment, Machine Parts and Engineered Products for various industries (e.g., food, agri, environment, creative, mining, and ship)

at least 6 trained NML staff

At least 5 locally fabricated

equipment for various

At least 1 Published manual

at least 1 new institution/agency

**Milestones** 

applications

5 UM of the fabricated

At least 5 machinist

/equipment designer

### People:

at least 6 trained NML staff At least 5 machinist

2028

/equipment designer

### Product:

- At least 1 manual of local fabricators
- At least 1 manual of results for scoping of the physical metrology
- At least 5 locally fabricated equipment for various applications

### Patent:

5 UM of the fabricated equipment

### **Publication:** At least 1 Published manual

Partneship: at least 1 new institution/agency forged

### **Overall Outcomes**

### Human Recourse

Completed

Target

- At least 6 trained NML staff
- At least 49
- machinist/equipment designer

### **R&D** Technologies

- 5 units calibration
- equipment and standards
- 8 new calibration services
- 6 PT schemes
- 4 training course on **Kibble Balance** 
  - Facilities / Services
  - At least 12 services offered for the established facility
  - · Services on primary and secondary calibration standards
  - 2 calibration rooms renovated
  - · At least 2 facilities for machining and fabrication

**BAGONG PILIPINAS** 

### < P145M>

- FASTPhils: Fabricators Assessment and Scoping in the Philippines
- Scoping for Physical Metrology (e.g., Mass, Temperature, Electrical, Fluid Flow, etc.)-
- Locally Design and Development of innovative, cost-effective, and appropriate Metal Equipment, Machine Parts and Engineered Products for various industries (e.g., food, agri, environment, creative, mining, and ship)

### **People:**

- at least 6 trained NML staff
- At least 5 machinist /equipment designer

### Product:

- At least 5 locally fabricated equipment for various applications
- Patent:

# **Publication:**

Partneship: at least 1 new institution/agency forger DOST4U

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2026

## 5 UM of the fabricated equipment

# At least 1 Published manual

People:

**Product:** 

Patent:

equipment

**Publication:** 

Partneship:

forged

Legend (Text Font): New/

Ongoing

# **List of Projects**

Sub-sector 1: Machining		Budget Allocation ('000)							
R&D Technologies	Project Title	2022	2023	2024	2025	2026	2027	2028	Status
	1. Design Improvement & Sea Testing of a Remote Controlled Weapon System	4,070.25	-	-	-	-	-	-	
1 Design and Development	2. Recovery and Reuse of Abrasive Grains from Waste Grinding Wheel	-	3,715.67	928.92	-	-	-	-	ongoing
1. Design and Development of innovative, cost effective and appropriate Machinery, Parts and Engineered Products (MPEPs) (e.g. food processing industry, Agri- industry, essential oils and fragrances, aerospace, etc.) Budget: 2022 (Php 70M) 2023 (Php 30M)	3. 'Project COBRA (Controller Operated Battle Ready Armament)	-	18,038.35	6,248.35	-	-	-	-	on-going
	4. Conversion of Quarry Wastes (Silt) Into High Temperature Refractory Bricks	-	4,150.88	1,037.72	1,318.49	-	-	-	ongoing (returned to Envi)
	5. Project 1. Development of sustainable and climate-resilient salterns: Best practicees, standardization, site mapping, and pilot establishment of saltern technology	-	-	17,226.80	9,616.64	-	-	-	to be implemented on 2024
	6. Project 2. Establishment of Asin R&D Center	-	-	30,533.58	8,472.92	-	-	-	to be implemented on 2024

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# **List of Projects**

Sub-sector 1: Machining and Fabrication									
<b>D</b> <sup>o</sup> D Technologiae			Ctatura						
R&D Technologies	Project Title	2022	2023	2024	2025	2026	2027	2028	Status
2. Integrated R&D Centers	1. Establishment of Metals and Engineering Innovation Center in CAR, Regions, I,II, III and X	14,419.29	13,435.30	-	-	-	-	-	extended until July 2024
Budget: 2022 (Php 110M) 2023 (Php 90M)	2. 'Establishment of Metals and Engineering Innovation Center for Regions IV-A, IV-B, V, VI, VII, VIII, IX, XI, XII and CARAGA	-	128,587.14	30,520.00	16,929.50	-	-	-	ongoing
3. Establishment/ Development of Primary/Secondary Traceability Standards in Support to Metals Industry	1. Aligning the Capabilities of Metro Manila's Local Legal Metrology Authorities to the ASEAN Guidelines for Non-Automatic Weighing Instruments (NAWI) and Fuel Dispensers	-	4,875.78	835.27	-	-	-	-	ongoing
Budget: 2023 (Php 166.9M)	2. Design and development of a subsonic wind tunnel system for airspeed realization and calibration	574.29	17,828.29	6,164.29	-	-	-	-	on-going
4. Capability Building for Certification for Aerospace Standards Budget: 2022 (Php 10M) 2023 (Php 10M)	no proposal received	-	-	-	-	-	-	-	for validation in FGD

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# **List of Projects**

Sub-sector 1: Machining and Fabrication									
			Otestare						
R&D Technologies	Project Title	2022	2023	2024	2025	2026	2027	2028	Status
5. Design and Development of Technology-Based Products for Aerospace Applications (Php 20M)	no proposal received	-	-	-	-	-	-	-	no accomplishment for this area
6. R&D Application on Robotics and Mechatronics for shop automation Budget: 2022 (Php 20M)	no proposal received	-	-	-	-	-	-	-	no accomplishment fo this area
7. Others (not identified in the roadmap)	Smarter OneLab for Industry 4.0 through Testing and Calibration, Education, and Discovery (OneLab for TED)	-	668,628.04	143,426.88	145,831.88	-	-	-	on-going

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## **Roadmap Assessment: Machining and Fabrication**

The Metals and Engineering Sector conducted a series of Industry Dialogue from 2020 to 2023 to update its roadmap. Through the conducted activities, the sector have its new priority programs and projects that any researchers can proposed on. However, only 12 projects were approved out of the targeted 28 projects and implemented from 2020 to 2023 with an actual budget of Php941.24M. Still, there were targeted topics that were not accomplished due to the following reasons:

- a. Most of the submitted proposals does not qualify under the priority areas based on the roadmap
- b. the proposals were not practical
- d. the proposals have no identified needs/demand
- e. No proposals received for specific calls in the roadmap

## Major Accomplishments

Established 5 Innovation Center for Fabrication of Agri and Industrial Equipment (CAR, I, II, III and X), fabricated 37 equipment, 4 equipment applied for UM, Trained 49 personnel on equipment fabrication and design, 25 partners

Challenges	Recommendations
1. Project that is dependent to season was not considered during its implementation which resulted to project extension	Identify the project/s that is/are dependent to season and possibly adjust its implementation to avoid extensions and other events that may defer its deliverables.
<ol><li>The cooperator has different specs of the equipment from initial consultations and agreed Collaborative Research Agreement.</li></ol>	Advise the implementing agency to coordinate with its cooperating agency and outline clearly the Collaborative Research Agreement of the project to avoid future problems.
<ol> <li>Undelivered major project's output because of unforeseen and unmanaged risk (e.g., no fabricator for specialized equipment).</li> </ol>	Advise implementing agency to clearly outline all possible risks of the project especially for equipment fabrication and procurement.
4. No proposals received in some of the identified priority areas in the past 3 years.	Validate with concerned industries the identified priority areas in the roadmap and be more specific with the call.
<ol><li>Low number of proposals received based on the priority areas due to dwindling pool of experts despite initial engagement.</li></ol>	Look for new linkages/partners/possible implementors of a project.
6. Low number of approved projects due to these reasons due to unmet criteria.	Advise in advance our linkages/partners/proponent about the Council's criteria of evaluation for them to be prepared of the documents needed prior to proposal submission.

## Way Forward

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- 1. Conduct pre-engagement activities/meeting with the sector's partners/implementors/proponent.
- 2. Widen sector's linkages by engaging to new industries.
- 3. Direct call and identify/match possible proponent and cooperating agency/industry that will do the identified area/s.
- 4. Conduct of site visits to various metals industries to update the sector of the latest trends and novel technologies.



# **Metals and Engineering Sector: Metal Casting**

### **Overall Strategies**

### Human Recourse

- Training of company personnel on foundry PNS (patter design)-metal casting
- Training on Heat treatment processes, anodizing and plating
- Metal Casting for Foundry Practice Certification for anodizing and electroplating

### R&D Technologies

- Reduction power cost in foundries, recycling of foundry sand
- Development of natural resource e.g. ferrous alloys and good quality pig iron
- Develop blind binderies molding system
- Standardization of Cupola Furnace
- High version of locally cast products
- Improved efficiency for melting due to high ٠ power cost.
- Tech transfer for the use of Pig Iron
- Utilization of local materials
- Metal Injection molding Technology
- Development of Innovative Casting Techniques (molding, melting, casting design)
- Development of Induction Furnace foundry equipment casted products

### Facilities / Services

- Metal Casting Innovation Center Foundry for Casting of Large Aluminum Molds
- Heat Treatment Program (facility and trainings)- Quenching and Tempering
- Pilot foundries in the Universities/
- Metal Injection Technology
- Training Center for Induction Casting Facility for Metals Parts and Components
- Metal Waste treatment facility
- Upgraded Heat Treatment Facility
- Chemical Analysis for non-ferrous with Certification 1807025
- Promotion of the use of local facilities and laboratories
- Upgraded Melting Facility/Induction Furnace
- Foundry for Cast Iron materials

## S&T Policies

Standard requirement reference for a metal casting facility. Standardization and

### harmonization of foundry practice.

## < P35M>

- · Establishments of Regional Innovation
- Centers in
- Region III (reflected in
- Machining) R&D on
- **Advanced Metal** casting and Metal Injection Technologies for
- Various < P15M>

Establishmen

t of Regional

Innovation

Center in

Region III

(reflected in

Machining)

Advanced

and Metal

Injection

Product:

Metal casting

**Technologies** 

R&D on

- **Applications**  R&D on Materials and Metallurgy Technologies for Various
  - **Applications**

# Various Applications

**R&D** Solutions

< P76M>

Establishments of

**Regional Innovation** 

Centers in Region III

(reflected in

Machining)

Establishment of

Upgraded Heat

**Treatment Facility** 

Establishment of

**Facilities that will** 

Casting Industry

R&D on Advanced

improvement of Metal

Metal casting and Metal

Injection Technologies

for Various Applications

2022

People:

at least 2 skilled

at least 2 skilled

metallurgist

Product:

products

at least 1 Heat

Places:

facility

Partnership:

personnel on metal

casting application

at least 8 developed

at least 2 developed

Treatment Facility

at least 1 Metal Casting

casted products

R&D on Materials and

Technologies for

contribute the

Metallurgy









metallurgy products

Places: ENCE AND TECHNOLOGY

Noity FOR INDUSTRY, ENERGY AND Standard requirements reference for a metal casting facility PMENT

### < P90M>

- Establishment of Facilities that will contribute the improvement of Metal Casting Industry Establishment of Upgraded Heat Treatment Facility R&D on Advanced Metal casting and Metal Injection Technologies for Various Applications R&D on Materials and Metallurgy Technologies for
- Various Applications Development of Machine Tool for Manufacturing Industry

  - People: 2023 at least 2 skilled metallurgist
    - at least 6 skilled personnel in metal casting
    - at least 2 skilled personnel in induction furnace
    - 2 skilled on heat treatment
    - Product/Services: · Availability of Heat
    - **Treatment Services** at least 2 developed
    - casted products at least 2 developed
      - machine tools at least 1 developed induction furnace
    - Places: at least 1 Metal Casting

facility

Policy:

< P65M>

R&D on Advanced Metal casting

Development of Machine Tool for

and Metal Injection Technologies

Standardization of Cupola

for Various Applications

Manufacturing Industry

Development of Induction

Furnace

Furnace

# regione DOST4 Standardization and harmonization of foundry

- at least 1 standardized cupola furnace
- at least 2 developed

2 skilled mettalurgist

2024

People:

furnace

casting

furnace

Product:

at least 2 skilled

at least 4 skilled

at least 2 skilled

personnel in metal

personnel in induction

personnel on cupola

- casted products at least 2 developed
- products at least 2 developed
- machine tools
- at least 1 developed induction furnace

## **Milestones**

Facilities / Services 2 established facilities for metals casting

### 1 heat treatment facility 1 innovation center for metals casting

S&T Policies 2 S&T policies

**BACONG PILIPINAS** 

Legend New/ Completed Taraet Ongoing (Text Font):

### < P55M>

- Standardization of Cupola
- Furnace
- R&D on Advanced Metal casting and Metal Injection Technologies for Various Applications
- R&D on Materials and Metallurgy **Technologies for Various** Applications
- Development of Machine Tool for Manufacturing Industry

# 2025

- People:
- at least 2 skilled personnel on cupola furnace
- at least 4 skilled personnel on metal casting
- application
- at least 2 skilled metallurgist

### Product:

- at least 1 standardized cupola furnace
- at least 2 developed casted products
- at least 2 developed products
- at least 2 developed machine tools

## **Overall Outcomes**

### Human Recourse

R&D Technologies

applications

at least 25 trained personnel on metal casting

at least 4 skilled personnel on cupola furnace

at least 16 developed casted products for different

at least 10 Developed metal casting, materials and

- at least 10 skilled metallurgist
- 2 skilled on heat treatment at least 4 skilled personnel in induction furnace

metallurgy technologies

at least 6 machine tool products

# Metals and Engineering Sector: **Metal Casting**

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## Overall **Strategies**

### Human Recourse

Training related to latest updates on Metal Casting Applications

### **R&D** Technologies

- Latest technologies on ship recycling
- metal casted products for various applications made form latest processes of casting
- Technologies on metal product development from recycled metals from ship

Facilities / Services Enhanced/upgraded Metal Casting facility for ship recycling

## **R&D** Solutions

### < P90M>

R&D on Localization of Metal Casted Products through Metal **Casting Processing Technologies** for Various Applications (e.g., vacuum sand casting, lost-foam casting, sand system, Metallurgy technologies, defense, etc.) R&D on Metal Product Recycling and Development (i.e., ship recycling)

People:

2027

At least 5 personnel trained in metal casting new technologies **Product:** 

- · at least 5 casted products developed for various application
- Developed at least 2 products from recycled ship

### Patent:

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At least 5 UM on developed products

## **Milestones**

### Facilities / Services

- At least 1 upgraded metal casting facility

R&D on Localization of Metal Casted Products through Metal Casting Processing **Technologies for** Various Applications (e.g., vacuum sand casting, lost-foam casting, sand system, Metallurgy technologies, defense, etc.) **R&D** on Metal Product Recycling and

< P80M>

Development (i.e., ship recycling)

2026

### metal casting new technologies Product: at least 5 casted products developed for various application

**People:** 

Developed at least 2 products from recycled ship

At least 5 personnel trained in

### < P90M>

- R&D on Localization of Metal Casted Products through Metal Casting Processing **Technologies for Various** Applications (e.g., vacuum sand casting, lost-foam casting, sand system, Metallurgy technologies, defense, etc.)
- R&D on Metal Product **Recycling and Development** (i.e., ship recycling)

# **People:**

2028

At least 5 personnel trained in metal casting new technologies **Product:** 

Done

- at least 5 casted products developed for various application
- Developed at least 2 products from recycled ship
- At least 1 Manual for proper identification of hazardous metals from recycled metals from ship
- 1 Manual for proper processes in dismantling ships to recover useful metals

### **Publication:**

· Process optimization of steel from recycled metals from ship

## **Overall Outcomes**

### Human Recourse

At least 45 trained personnel

### **R&D** Technologies

at least 30 products developed for various applications





## **Roadmap Assessment: Metal Casting**

Conducted an industry consultation last November and December 2022 to assess if the metal casting industry still needs R&D intervention or assistance from the Council. However, no proposals received for this sector since 2020.

## **Major Accomplishments**

Established 1 Innovation Center for Metal Casting in Region III.

Challenges	Recommendations						
<ol> <li>Local metal casting industries do not want to adapt new technologies that would help their production to become easier, instead they preferred to maintain their traditional casting method/s.</li> </ol>	Identify new projects/technologies that will improve their existing methods/processes and will reduce their energy and operational cost.						
2. Casting of local products entails high energy costs for manufacturers; thus, majority of the metal casting companies are shifting from manufacturer to trader of imported metal casted products.							
3. No available raw materials locally. Thus, the Philippines is still importing raw materials (i.e., steel, sand, machines) which entails logistics and container costs that adds-up to the local product prices	Look for alternative/ develop a program about R&D on metal recycling to possibly address the shortage of raw materials.						
4. The adaptation of the locally-produced metal casted products are hindered by the issue of importation; this results for the companies to become uncompetitive and incapable of supplying the	Advise the Metal Casting Industry to:						
market demand because imported casted products from China are cheaper compared to local products	<ul> <li>outline/identify the standards required by the metals industry and create possible program that will address the identified need.</li> </ul>						
5. Limited experts in the field to undertake R&D.	Establish new linkages						
6. The government has no policy to support the local metal casting industry to limit the importation issue.	<ul> <li>create a strong TWG that will provide technical support and participate in the series of FGDs, consultation meetings, and policy development activities</li> </ul>						

**Way Forward** 

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- 1. Create and align new programs for the metal Casting Sector.
- 2. Solicit R&D projects from MEIC metal casting facility researcher
- 3. Matching of researchers with industry player for possible collaborative R&D projects
- 4. Encourage the metal casting companies who participated in FGDs sessions to consider collaborative proposal development with identified partner institution through proposal shepherding (proposal writeshop and development) which is industry-based in order to come-up with project proposals fitting/matching the priorities of the M&E Roadmap.

