THE PHILIPPINE METALCASTING INDUSTRY

A 2017 Study

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Department of Science and Technology
Metals Industry Research and Development Center

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The Cover: Molten metal inside the molds. Picture was taken at MIRDC Foundry Shop.

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INTRODUCTION

The metalcasting sector is one of the sectors comprising the metal engineering industry. This sector is an upstream industry following the primary process of mining mineral ores and extracting the metal from it. The sector serves as the source of raw materials within the metal engineering industry and provides machinery, tooling, and parts used in other industries such as agriculture, housewares, chemical/petrochemical, water/sewerage, machinery, mining, cement, electronics, automotive, defense/armaments, and medical/dental. Almost every metal product processed by the metal engineering industries starts from the metalcasting sector. Currently, the metals, engineering and allied industries is the central focus of the industry studies, instead of metal engineering industry or metalworking industry which produce diverse products for agriculture, construction, and other various industrial applications.

In the 2003 study[1], there are about 295 foundry shops operated by 195 identified companies. Some of the companies operate more than one foundry. However, in the 2013 profiling study[2], the number of identified companies decreased to 102; while this year, the figure further reduced to 85 metalcasting companies.

Objectives of the Study:

This study aims to provide an analysis of the Philippine metalcasting industry. Specifically, this study intends to:

1. Provide an assessment of the metalcasting industry in terms of facilities, manpower, and investment requirements.

2. Identify the needs of the metalcasting industry in terms of technology requirements and technical capability of manpower including issues and concerns, as well as the plans of local metalcasting shops where the government could intervene.

3. Come up with recommendations and programs that will address current issues and concerns and will push the metalcasting sector upward.

Methodology

The primary data were gathered through a survey of 85 metalcasting shops conducted in 2017 by the MIRDC team. Data were obtained through filled-out survey questionnaires, personal interviews, and actual plant visits. Questionnaires were designed and distributed to elicit responses that would reflect the present profile of the industry, its structure, nature of business activity, market served, level of production and consumption, its technology and workers' training requirements, and issues and concerns that the government could intervene.

Secondary data on import and export of metalcasting products were sourced from the Philippine Statistics Authority (PSA).

To confirm the results of the survey, a focus group discussion with industry players was also conducted.

Scope and Limitations of the Study

This study covered the general profile of the metalcasting industry relative to operational aspects, market analysis, problems and issues, and business condition. The List of Identified Potential Metalcasting Survey Respondents contained 85 companies sourced from the DTI-registered metalworking shops (where metalcasting shops are included), from various directories and internet searches as of the period covered this study. These companies are located in the NCR, Regions 1, IV-A, VI, VII, and XI. However, 30 companies declined to be surveyed, 7 companies have already closed shop and one company had stopped operating. Hence, only 46 companies responded favorably to this industry study.

This study considered the following limitations: a number of respondents did not disclose all the information needed or failed to determine the right answer to the survey form. There were respondents who did not keep records of their business operations and intentionally refused to reveal wholly their business profile. Nevertheless, these limitations did not hinder the study to achieve its objectives.

1 Department of Science and Technogy – Metals Industry Research and Development Center. The Philippine Metalcasting Industry Study. Taguig, Phils.
2 Department of Science and Technology – Metals Industry Research and Development Center. The Philippine Metalworking Industry Study (2012). Taguig, Phils.

Figure1. Geographical Distribution of Metalcasting Shops

INDUSTRY PROFILE

There are 3,211 metalworking companies belonging to the different sectors of the Philippine Metalworking industry i.e. machining, heat treatment, welding, tool & die, forging, metalcasting, stamping and electroplating. Based on the Philippine Metalcasting Industry Study conducted by MIRDC in 2003, there were 195 identified metalcasting shops. However, as of the period of this study, there were only 102 metalcasting shops listed under the Metalcasting Shops, a drop of 48 percent from the 2003 study. Likewise, MIRDC conducted another profiling study to 50 shops in 2010 to 2012.

The number of metalcasting shops surveyed in the six (6) regions of the country is topped by the National Capital Region (NCR), followed by Region IV-A, and Region VII where various businesses thrive and industrial zones were located. (see Table 1). There were no metalcasting shops identified in Regions II, IV-B, V, XII, CARAGA, ARMM and Cordillera Administrative Region (CAR) during the study. Metalworking processes in these regions were predominantly welding & fabrication.

Table 1 shows that 19 shops or 41.3 percent of the total number of shops were found in the NCR. Thirty (30) shops or 35 percent of the total shops declined. Majority (24 shops or 63%) of the 38 shops that declined, closed and stopped operating were found in NCR.

Table 1. Geographical Distribution of Metalcasting Shops

Area/Region	No. of Shops	Percent (%)
NCR	19	41.3
Region I	3	6.5
Region IV-A	9	19.6
Region VI	3	6.5
Region VII	11	23.9
Region XI	1	2.2
Total	**46**	**100**

Organizational Structure

Figure 2 shows that 16 shops (35 percent of total shops) were established during the period 1980 and below. 10 shops (22 percent) were established in 1991-2000, nine shops (20 percent) in 2001-2010 and eight shops (17 percent) in 1981-1990. Only two shops (4 percent) were established during the period 2011-2015.

As shown in Figure 3, the metalcasting companies were predominantly organized as corporation which made up 85 percent of the total shops surveyed, both single proprietorship and partnership have seven percent and two percent representing government agency. This is similar to the result of

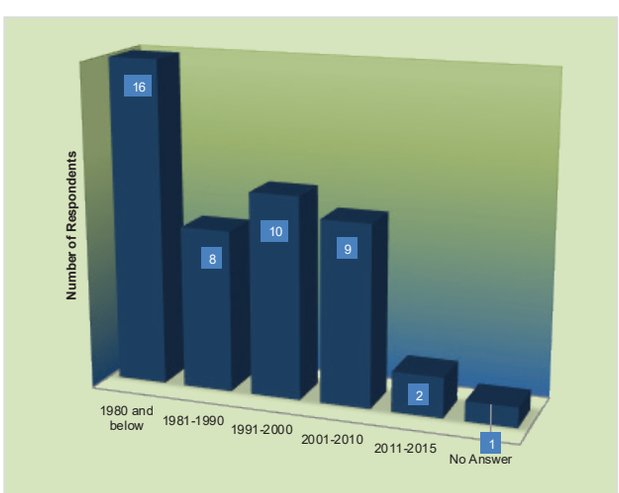

Figure 2. Year of Establishment of Metalcasting Companies

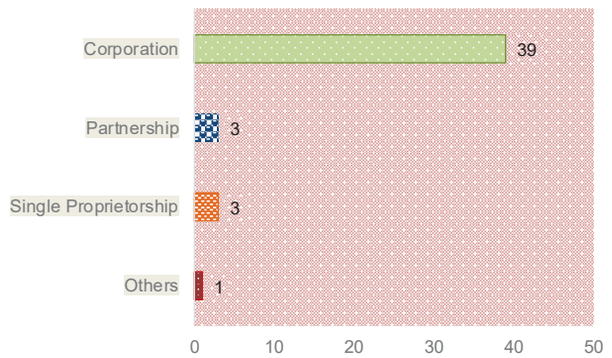

Figure 3. Form of Business

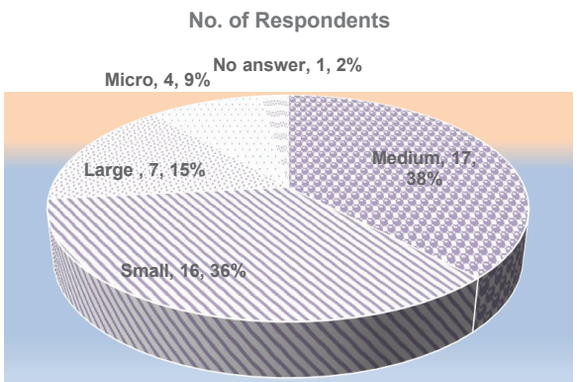

Figure 6. Distribution of Shops According to Assets

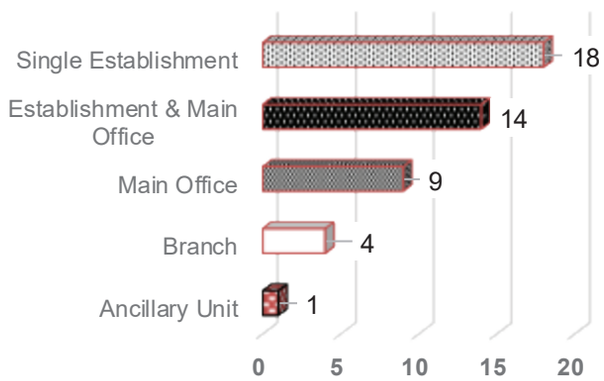

Figure 4. Type of Economic Organization

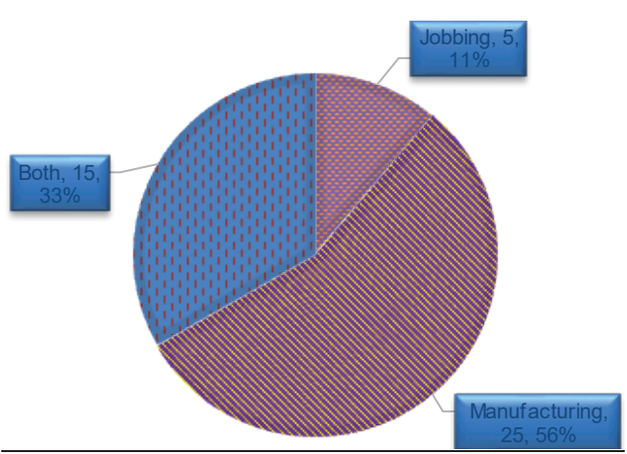

Figure 5. Types of Business Organization

Table 2. Type of Business Activity

Type	Number of Respondents
Independent	44
In-house/ Captive	1
TOTAL	45

the 2010-2012 study where 72% of the total number of companies was organized as corporation.

Figure 4 shows that 18 shops (39 percent of the total respondents) operates as a single establishment. 14 shops (30 percent) operates with a main office and an establishment; 9 shops (20 percent) were surveyed in their main office; 4 shops (nine percent) were surveyed in their branch; 1 shop (2 percent) were surveyed in their ancillary unit.

Figure 5 shows the different types of business organization. As shown, majority or 56 percent of the shops were engaged in manufacturing, Combined manufacturing & jobbing followed with 33 percent. Jobbing followed with 11 percent.

Table 2 shows that 44 shops or 97.8 percent were operating as independent shops and 1 respondent or 2.2 percent as captive or in-house.

As shown in Figure 6, a total of 17 shops or 38 percent were classified as medium-scale (P15million to P100 million) enterprises, followed by small-scale (P3 million to 15 million) with 16 shops or 36 percent, large-scale (greater than 100 million) with 7 shops or 15 percent, and micro-scale (less than P3 million) with 4 shops or 9 percent. The remaining 2 percent comprised the shops who did not disclose their business assets.

Employment

Table 3 indicates that 3,133 or 88 percent direct workers of the total workforce, while 132 or 4 percent were employed on contractual basis. It can also be seen in the table that majority or 2,663 (85 percent) direct workers were under production.

Table 3a depicts the Workforce of the shops classified according to capital. As depicted, of the total workforce in the metalcasting shops, there are more employees in the medium-sized shops than the large-sized ones.

Figure 7 illustrates the distribution of shops according to employment; the small shops comprised the biggest share with 60 percent while micro shops got the least with four percent.

Most of the respondent-shops (27 out of 46) have 10 to 99 employees, followed by medium and large (both have 8 out of 46) with 100 to 199 employees and with more than 200 personnel, respectively. Most of the respondent-companies are still small-scale.

Table 4 reflects the distribution of shops relative to training of personnel. 63 percent of the total workforce of the metalcasting companies have formal training and the remaining 37% are dependent only on their experience and learning through the coaching of the manager and supervisors and based on their long years of experience. Some respondents however, failed to disclose their detailed information due to inavailability of records.

Table 3. Workforce Employed in the Shops

Category of Shop	No. of Workers		
	Direct Workers		Contract Workers
	Production	Non-Production	
Sub-total	2,663	470	132
Total	3,546		

Note: The unaccounted 281 personnel are due to "on the job trainees" (OJT).

Table 3a. Workforce Employed in the Shops

Classification	Total Workforce	Production	Non-Production	Contract Worker
Micro (1-9)	53	39	12	7
Small (10-99)	794	477	167	150
Medium (100-199)	1,654	1,251	169	0
Large (200 or more)	1,054	904	140	10

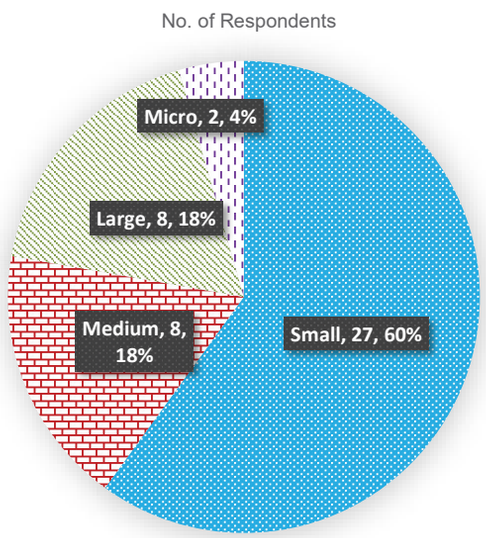

Figure 7. Distribution of Shops According to Employment

Table 4. Training Distribution with Experience and Level of Skills

Position	With Formal Training		Without Formal Training	
	Male	Female	Male	Female
Managers	54	16	9	5
Engineers / Supervisors	114	28	23	18
Quality Control Inspector	61	44	16	21
Foundry Technician / Machine Operator	682	108	440	22
Maintenance Workers	80	17	18	0
Utility Workers	44	60	64	7
Contract Workers	75	28	131	59
Total	**1,110**	**301**	**701**	**132**

**total: only 2,244 out of 2,663 positions specified.*

As illustrated in Figure 8, 35 respondent-companies are also were engaged in machining, 23 respondents in welding, 18 respondents in heat treatment, 10 respondents in surface finishing or plating and only four respondents were engaged in forging. It was noted that there were multiple answers from the respondents. It only indicates that some respondents were utilizing two or more metalworking processes simultaneously.

Table 5 shows the average years of experience and the level of skills of the workforce. The rank of personnel is positively related to their average years of experience as stated in Table 3. The top management has longer years of experience compared to the rank and file personnel.

The personnel are still rated as very satisfactory (4) as shown in Table 5.

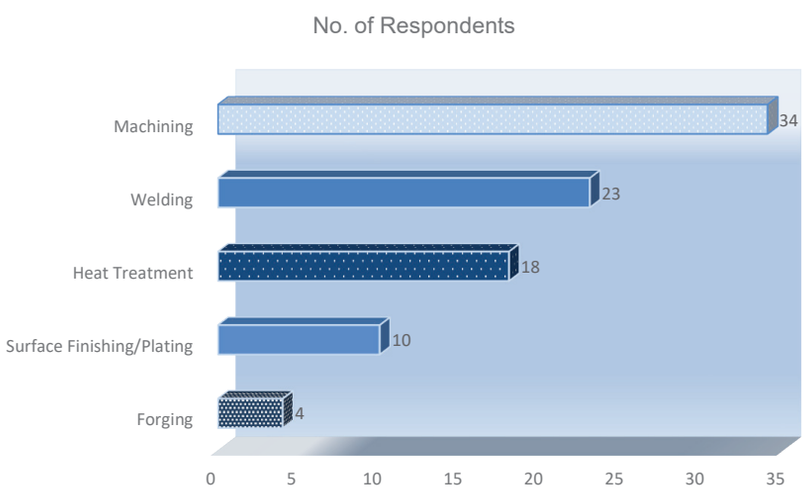

Figure 8. Other Metalworking Processes Utilized by the Respondents

Note: multiple answers

Table 5. Employees' Average Years of Experience and Level of Skills

Position	Average Years of Experience	Level of Skills
Managers	16	4
Engineers / Supervisors	15	4
Quality Control Inspector	11	4
Foundry Technician / Machine Operator	12	4
Maintenance Workers	13	4
Utility Workers	6	4
Contract Workers	5	4

MARKET PROFILE

Table 6 reflects the comparative annual production (in peso) for the period 2014 to 2016 showing an upward or increasing trend. The annual cost of production in 2016 was reported as 1,289,409,017.58 which when compared to the annual sales in 2016 showed a gross margin of 3.01 billion pesos. Due to confidentiality issues, 14 respondents did not disclose the amount of their annual production, while 24 respondents did not disclose their annual cost.

Table 6A shows the stratified Annual Production for 2016. As shown, the combined production of
the micro, small and medium shops is simply equal to about half the Total Annual Production of the large-sized companies.

In Figure 9, the revenue generated by the respondent-companies reveals that 10 shops (22 %) generated revenue of between 1 million to less than 10 million. Followed by 6 shops (13 percent) with revenue of 50 million to less than 500 million. 5 shops each revenue range were able to generate 10 million to less than 50 million and more than 500 million pesos. However, it was noted that about 12 respondents (27 percent) did not disclose their data.

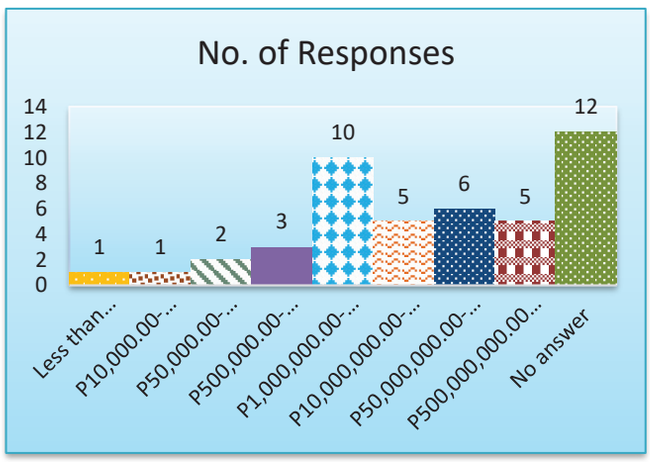

Figure 7. Distribution of Shops According to Employment

Table 6. Annual Production

Year	2014	2015	2016
Annual Production (Peso)	3,674,048,011.76	3,824,105,278.76	4,266,525,999.55

Table 6A. Annual Production Based on Classification

Classification	Total Annual Production (Peso)	Percentage
micro	4,056,260.85	0.31
small	47,780,575.00	3.71
medium	343,342,181.73	26.63
large	894,230,000.00	69.25
Annual Cost of Production for 2016	**1,289,409,017.58**	**100.00%**

PSA STATISTICS ON IMPORT[3]

On imports, the sector showed a constant Cost Insurance and Freight value of $1.41 billion in 2013 and 2014. The import figure reflected in Figure 10 showed a decrease in 2015 but a substantial rise in 2016 by almost a billion dollar.

Top import commodities in 2016 were:
1. mechanical shovels & excavators
2. mopeds
3. aircraft engines
4. passenger lifts
5. front-end shovel loaders

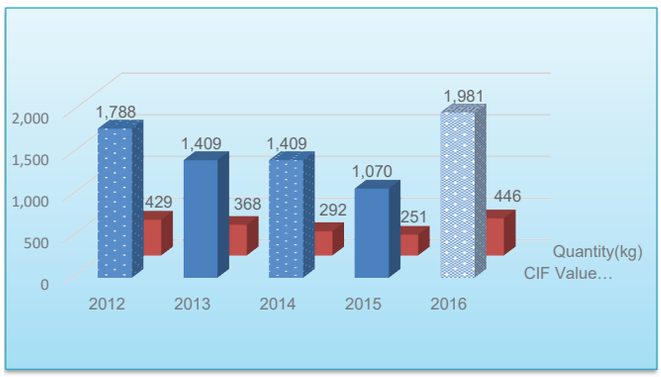

Figure 10. Imported Metalcasting Products

PSA STATISTICS ON EXPORT[4]

As reflected in Figure 10, the export in Free On Board value of cast products rose to $960 million in 2015, but decreased to $763 million the following year, 2016.

Top export commodities in 2016 were:
1. stator w windings & machined die-casted rotors
2. enamelled iron - household articles,
3. ships or boats propellers and blades,
4. on tyres –crane trucks and
5. clutches and shaft couplings

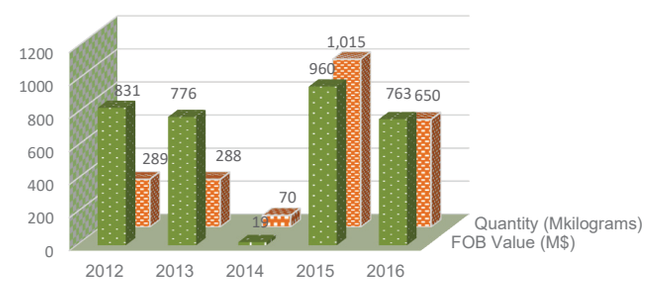

Figure 11. Exported Metalcasting Product

Figure 12 shows the sectors served by the metalcasting industry 22 shops (48 percent) cater to industrial machinery/agricultural industry, 15 shops served the automotive industry, 10 shops served the construction industry, 7 shops are into metalworking industry, 6 shops served the cement industry. 4 respondents served the appliance industry, only 3 respondents served the mining industry, and 11 shops served other industries such as Food, Waterline, Engineering Services, Marine and Water, Medical Equipment, Chemical and Shipping. Compared with the 2010-2012 study, automotive, construction and agriculture ranked as the top three leading market.

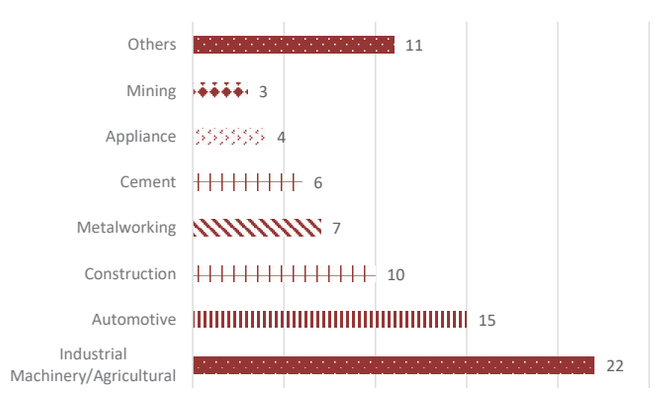

Figure 12. Sectors Served

Note: multiple responses

3 Philippine Statistics Authority.2014-2016. Foreign Trade Statistics. Vol.1 Imports, Manila, Philippines.
4 Philippine Statistics Authority.2014-2016. Foreign Trade Statistics. Vol.2 Exports, Manila, Philippines

Table 7 shows the number of companies with similar service offered within their area: 17 shops (37 percent) had 3-5 competitors, 13 shops (28 percent) had either more than 5 competitors, no idea or no competitor, 8 shops (17 percent) had only 1-2 competitors while the remaining 8 respondents had no answer.

Table 8 shows the level of competitiveness of metalcasting businesses in the country. Majority (51 percent) responded that their businesses were very competitive.

The 23 companies who responded "very competitive" are serving one or more sectors.

Table 9 displays the percentage of customers served by each respondent. The most common percentage of customers served was less than 80 percent, followed by less than 50 percent and then, less than 25 percent.

Table 10 shows the frequency of customers' availment of products and services. A shown, most frequent availment of products and services is 2 to 4 times with 12 responses, followed by 10-15 times with 10 responses, and others with 8 responses.

Table 7. Companies with similar service in the area

Frequency of Availment of Products and Services (per year)	No. of Responses
2-4x	**15**
10-15x	**10**
Others	**8**
5-6x	**5**
7-9x	**1**
No Answer	**7**
Total	**46**

Table 8. Level of Competition

Number of companies	No. of Responses
3-5	17
Others (more than 5, no idea, no competitor)	12
1-2	8
None (0)	1
No Answer	8
Total	46

Table 9. Market Saturation

Competition	No. of Responses	Percent Share
Very Competitive	23	50
Extremely Competitive	9	20
Moderately Competitive	7	15
No Answer	4	9
Not Competitive at all	2	4
Slightly Competitive	1	2
Total	46	100

Table 10. Frequency of Availment of Products and Services

Percentage of Customers Served	No. of Responses
<80%	12
<50%	10
<25%	6
≤100%	5
No response	13
Total	**46**

TECHNICAL PROFILE

This portion of the study includes the following: equipment, other metalworking processes employed, different methods used in metalcasting, different types of foundry or metalcasting facilities, the raw materials used by a metalcasting shop, the various quality assurance instruments and testing laboratory equipment and instruments. It also includes the various standards than can be used for the cast products and the additives used in the melting of metals.

METALCASTING

Metalcasting or foundry is the process of pouring a molten metal into a mold through a hollow cavity of the desired shape, and this is allowed to solidify by cooling. The product is called a casting. Figure 13 below shows the process flow chart of the metalcasting operation.

Processes vary for metalcasting. There are 3 types: precision or investment casting, conventional or sand casting and die-casting. There are various equipment used in a foundry step by step process such as inspection of raw materials (chemical analysis), patternmaking (precision or investment casting or conventional or die casting), then molding, melting, pouring, fettling and quality control inspection.

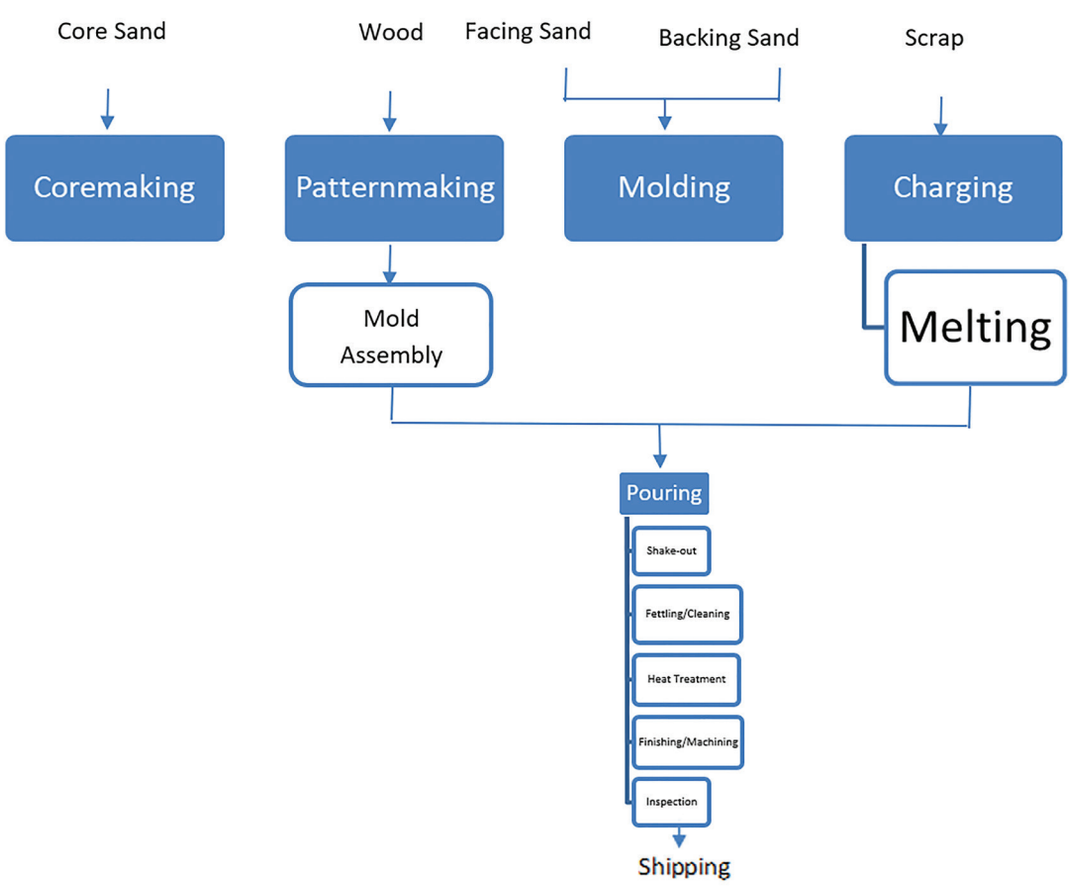

Figure 13. Process Flow Chart of Metalcasting Operation

Equipment

For patternmaking, Table 11 shows that there are 4 types of equipment being used and wood lathe is the most utilized equipment, followed by the wood planer, bandsaw, and wood milling. Majority of the wood lathes were reported as imported and brand new when they were acquired, while most of the wood planers were locally purchased and brand new.

For investment casting, the pattern is usually made of wax, rubber or plaster of Paris, while conventional usually utilize wooden patterns. The die casting process uses aluminum material as pattern.

Table 12 shows the mold-making equipment used in the metalcasting process. Molds are made for the purpose of preparing the molten metal to be poured out at the specified sand mold or ceramic mold. Investment casting uses ceramic molds while conventional uses sand, clay and stainless steel for die-casting process. In the preparation of the mold, a sand mixer is needed. To recycle the sand molds, the sand reclaimer is used. Sand mixer and sand reclaimer were the most frequently used equipment with 30 out of 41 and 10 out of 13, respectively, were in working condition.

Table 13 indicates the melting equipment used by the respondent-companies such as induction furnace, crucible and melting machine. 46 shops or 96 percent reported that the induction furnaces are in working condition and majority was imported and brand new when acquired. Similarly, crucible furnace has also 96 percent in working conditions. However, Majority are imported and brand new when acquired. In the case of melting

Table 11. Pattern Making Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Wood Lathe	14	13	0	6	2	6	5
Wood Planer	13	8	0	2	5	3	2
Bandsaw	13	8	0	3	3	2	4
Wood Milling	5	2	0	1	0	1	1

Table 12. Molding Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Sand Mixer	41	30	0	12	8	11	8
Sand Reclaimer	13	10	0	4	2	4	3

Table 13. Melting Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Induction Furnace	48	37	2	20	9	22	6
Crucible Furnace	45	37	2	16	21	13	9
Casting Machine - Centrifugal	2	2	0	2	0	2	0
Casting Machine - Vacuum	2	2	0	2	0	2	0
Melting Machine	2	2	0	2	0	2	0

Table 14. Fettling Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Sandblasting Machine	47	21	1	5	12	12	2
Shotblasting Machine	27	22	1	13	2	9	1
Grinding Machine	120	102	2	56	27	29	12
Shakeout Machine	17	13	0	6	5	6	1
Welding Machine	111	101	0	20	64	62	5

Table 15. Investment Casting Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Wax Injection Machine	39	13	0	8	7	11	1
Autoclave Machine (Dewaxing)	10	8	0	5	3	6	1
Shell-firing Furnace	7	7	0	3	2	5	1

machine, all casting and melting machines are in working condition and are imported and brand new when acquired.

Table 14 lists the fettling equipment, as follows: sandblasting, shotblasting, grinding machines including portable grinder, shakeout and welding machines. There are 264 fettling machines still in working condition while only four were already in non-working condition. There were no records of the mode of acquisition of some equipment.

For investment casting process, Table 15 reveals that the commonly used equipment are: wax injection, autoclave machine, and shell-firing furnace. There are 13 out of 39 wax injection machines still in working condition, but majority were imported or acquired abroad and brand new. There are no reported non-working equipment but both autoclave and shell-firing furnace are of the same situation as the above-mentioned equipment.

Table 16 enumerates the quality control (QC) instruments: pyrometer, hardness tester, sand testing laboratory, spectrometer, Vernier caliper and x-ray machine, portable tester, hydraulic gauge. There are 17 out of 45 units of pyrometer in working condition, while only 2 are in non-working condition. Majority of QC equipment were sourced abroad and brand new when acquired.

Table 17 shows other equipment utilized by metalcasting shops as follows: casting machine-centrifugal, casting machine-vacuum, disc & jolt squeeze (molding). For machining: lathe machine, drilling machine, milling, grinding and cutting machines and box benders. There is also a compressor for welding.

Table 16. Quality Control Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Pyrometer	45	17	2	16	5	15	0
Hardness Tester	20	15	0	11	4	8	0
Sand Testing Laboratory	6	5	0	3	0	2	0
Spectrometer	6	5	1	6	0	4	0
Vernier Caliper	9	9	0	5	4	5	4
X-Ray Machine	1	1	0	1	0	0	0
Microscope	1	1	0	0	1	0	1
Thermal Analysis	1	1	0	1	0	1	0
Portable Tester	1	0	0	1	0	1	0
Hydraulic Gauge	2	0	0	2	0	2	0
UTM	3	2	0	2	0	2	0

Table 17. Other Metalcasting Related Equipment

Name of Equipment	Quantity	Present Condition		Mode of Acquisition			
		Working	Non - Working	Imported	Local	Brand New	Second Hand
Lathe Machine	5	5	0	2	3	3	2
Drilling Machine	3	3	0	2	1	2	1
Portable Grinder	5	5	0	0	5	5	0
Cutters	3	3	0	3	0	3	0
Milling Machine	1	1	0	0	1	1	0
Pneumatic Molding Machine	1	1	0	0	1	0	1
Box Benders	2	2	0	2	0	2	0
Compressor	1	1	0	0	1	0	1
Disc (Moulding)	1	1	0	0	1	0	1
Jolt Squeeze (Moulding)	6	6	0	6	0	6	0

Customer's Quality Requirement

Table 18 summarizes the quality requirement of customers. Majority of customers require accurate specified dimension or measurement, followed by the physical and mechanical tests and chemical analysis of the product. Other requirements are hardness, absence of internal defects and others.

There are three types of metalcasting processes employed and they are investment casting, die casting and conventional casting. Of these processes, conventional is the most common, followed by die casting and investment casting. This is shown in Table 19. Conventional casting is mostly for large castings, while investment and die casting are more of precision and mass production.

Table 20 shows the type of molding used or preferred by the industry. Most foundry shops use CO2 for molding with either silica or naturally bonded sand, followed by ground soil and furan material. Molds must have the capacity to keep its shape throughout the casting operation. Sand mixer mixes the binder and sand keeping the sand adhering together. Clay also serves as an essential binder. Other agents such as organic resins (e.g. phenolic resins) and inorganic bond agents can be used to keep the sand bonded and improve the mold.

Table 21 indicates the raw materials being used by the respondent-companies. The commonly used raw material as disclosed by the respondents is mild steel scrap with 3,677,800 kilograms. For the mold making, silica sand, CO2/other gases, green sand, reclaimed sand, coke and other materials, such as aluminum, zinc, cast iron, steel (hot and cold rolled steel and tool steel), brass & bronze (including white bronze), wax, wood and various chemicals (sodium silicate, sodium benzonite, and mixed chemicals) are preferred.

Table 18. Customer's Quality Requirement

Quality Requirement	No. of Responses
Specified dimension / measurement	26
Chemical Analysis of the product	19
Physical and mechanical tests	20
No internal defects	16
Hardness	15
Others (Standard Quality, acceptability, ASTM standards, visual, pattern-customer supplied pattern/ casting-buying clean and good quality of scrap / casting finish - QC done by customers, Microstructure, CE Meter, Chill Test, immersion pyrometer, surface finish, specified design, karat size, draft testing)	11

Table 19. Type of Metalcasting Process Employed

Process	No. of Responses
Conventional	32
Die Casting	11
Investment Casting	7

Table 20. Types of Molding Process Used

Process	No. of Responses
Furan	7
CO2	16
Ground Soil	11
Others (Silica sand, Permanent mold, synthetic sand, resin sand, green sand/ shell process, ceramic, resin coated sand, metal , aluminum, sandcasting, PEP SET chemical)	13

Table 21. Raw Materials Used by the Respondents

Materials	No. of Shop Respondents	Source		Volume (in Kg.)
		Local	Imported	
Silica Sand	25	12	15	2,223,065.22
CO2/Other Gases	23	21	2	78,119.60
Green Sand	8	7	1	107,000.00
Reclaimed Sand	8	7	1	56,500.00
Coke	13	5	7	249,300.00
Metals				
Pig Iron	10	4	7	1,457,000.00
Ductile Iron	5	4	1	312,000.00
Mild Steel Scrap	16	13	3	3,685,072.73
Stainless Steel	15	12	3	457,300.00
Bronze	12	11	0	89,005.26
Others	27	14	8	3,901,212.08

BUSINESS OUTLOOK

According to the Philippine Metalcasting Association of the Philippines, Inc. (PMAI), the metalcasting industry is changing with the development, adoption, and use of new and improved materials for casting based on the changing properties and performance requirements. Some of the advances in materials technology which are expected to take on new markets are the following: aluminum and magnesium castings (inhibiting properties for aerospace, electrical energy and automotive markets); high quality ductile iron with tighter tolerance and controlled microstructure and properties for automotive markets; high alloy steel casting with increased heat resistance for use in pump, valve, furnace and turbine applications; and copper-based alloys as substitute for lead due to environmental concerns.

The industry is also anticipating to engage in activities resulting from the increasing acceptance of new emerging materials and applications in various industries, such as production of higher value castings from aluminum, steel and ductile iron; manufacture of aluminum and magnesium alloys due to the general trend in weight reduction in automobiles; applications of titanium castings in aerospace and automotive industries; and the use of aluminum-lithium alloys as casting materials for aerospace to replace components previously made from wrought materials[i].

In 2017, the Metals Industry Research and Development Center conducted the metalcasting industry study nationwide. Despite the experienced hardships and circumstances, the survey team were able to convince 46 companies to participate in the industry study.

The data gathered during the study disclosed that some of the respondents in the metalcasting industry were engaged in the casting of the ferrous materials, such as cast iron, cast pipes and fittings (drain, sewer, vent line) gates, manhole frame and cover; precision parts of machines; parts of equipment used in mining, cement and aggregate industries, agriculture industries - like hot pepper seed extractor, tiger grass pollen extractor, portable corn sheller and other postharvest equipment; parts used in waterline industry; brake drum, disc brake and other automotive parts for transportation industry; furniture hardware like handles, home decors and accessories for the home and décor industries; and impeller, cast iron pipes and fitting, manhole frame and cover for industrial sectors. Respondents are also engaged in the casting of non-ferrous materials. To mention, some are aluminum die casting; bronze and brass casting; and aluminum alloy wheel manufacturing.

Political, economic, social, technological and environmental concerns are some of the basic factors that really affect the status of the business. The study disclosed that amid the rising cost of production raw materials, utilities and even labor, the respondents were trying to be more vibrant and motivated to surpass all the problems arising in the industry. As reflected in Tables 22 and 23, when the business outlook of the company was examined for the previous year, the study divulged that 50 percent of the respondents were optimistic that business is improving, while improving business is only 35% for the previous year. Further, as shown, No Change as a business outlook is down from 41% in 2016 to 30% in 2017. It is a fact that business is a cycle of upturns and downturns. Despite the unforeseen situation, company owners are looking forward for a bright future.

Table 22. Business Outlook for the Previous Year (2016)

Responses	No. of Shops	% Share
1. Improving	23	50
2. No Change	14	30
3. Deteriorating	5	11
4. Depends	4	9
Total	**46**	**100**

Table 23. Business Outlook for the Current Year 2017

Responses	No. of Shops	% Share
1. Improving	16	35
2. No Change	19	41
3. Deteriorating	4	9
4. Depends	7	15
Total	**46**	**100**

Strengths/Opportunities:

Capitalizing the strengths of the company is a fundamental task that leads to the success of a business. Utilizing the best of a company's strengths, helps a company to engage in and carries out its tasks at a higher level. As illustrated in Figure 14, quality

5 http://industry.gov.ph/industry/metalcasting/

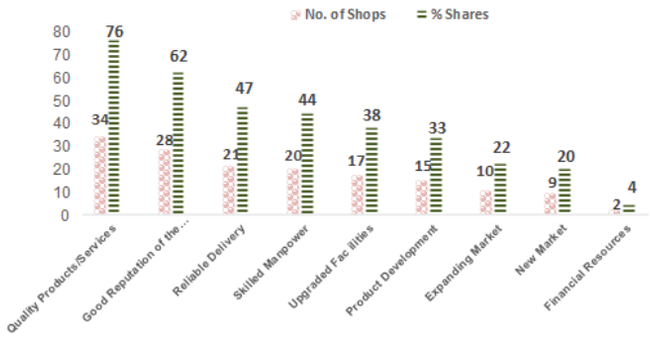

Figure 14. Strengths/Opportunities of the Respondents

Note: multiple answers

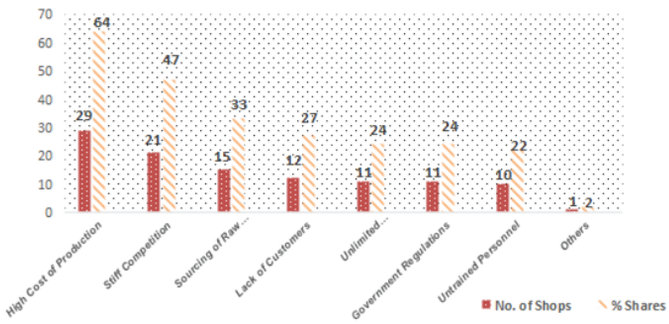

Figure 15. Weaknesses/Threats to the Business

Note: multiple answers

of products/services (76 percent); good reputation of the company (62 percent); reliable delivery (47 percent); skilled manpower (44 percent); upgraded facilities (38 percent); and product development (33 percent) were the respondents' guiding strengths/opportunities. Good reputation in terms of the company's vision and mission, thrust, level of knowledge/standards, determination, honesty, tactfulness of the people, among others are the traits to be cultivated, enhanced and practiced to be able to sustain a business, attract customers, increase job orders, and gain more profit. Customer loyalty highly depends on the reliability of the company's products/services delivery. It was noted that there were multiple answers from the respondents. It only indicates that some respondents consider two or more factors as their strengths/opportunities. Expanding Market with 10 responses, New Market with 9 and Financial Resources with 2 comprise the Others shown in Figure 14.

Weaknesses/Threats:

Several companies experienced operational difficulties that are unavoidable. Significant issues and concerns on a daily basis arises during the operation of the company. Learning from these mistakes will provide a great opportunity for the company to move on to a brighter future. In the metalcasting sector, high cost of production is the major concern of business owners. Figure 15 shows that 64 percent of the respondents were concerned about this issue. High production cost is a result of high cost of raw materials, labor (manhour/machine hour), and electricity. The accelerating cost of production inputs affects pricing which may eventually lead to decline in competitiveness. The stiff competition adds to the threats experienced by metalcasting companies. In order to survive competition, companies must be efficient in order to reduce costs, produce quality products and services, give the best price for its products, and optimize the use of available capacity and capability of their shops. Difficulty in sourcing of raw materials, unlimited capacity/capability, government regulations, and untrained personnel were the other problems hounding the metalcasting sector.

Production Problems, Issues and Concerns:

Amidst the best efforts that the owners were exerting to prosper the business, there will always be problems, issues and concerns to confront and solve.

Figure 16 shows that sourcing of raw materials is still a very pressing problem representing 51 percent of the total responses. Lack of raw materials and inferior quality cause production delays that lead to low productivity. Reflected in the figure below, equipment ranked second which 35 percent of the total responses. This only means periodic maintenance is necessary to sustain an active production, meet maximum utilization of the machines and improve the quality of delivered products. The third issue is human resource with 28 percent of the total responses. This concern is related to the level of skills and technical know-how of their employees. Company owners wanted their employees to have the required technical abilities and capability to be competent in whatever jobs they will encounter. On the other hand, the respondents were looking forward for some of foundry technology seminars to make them abreast on the latest technology with regards to metalcasting operations. QA/QC, layout, utilities, waste treatment, and utilization rate are some areas that need to be addressed immediately.

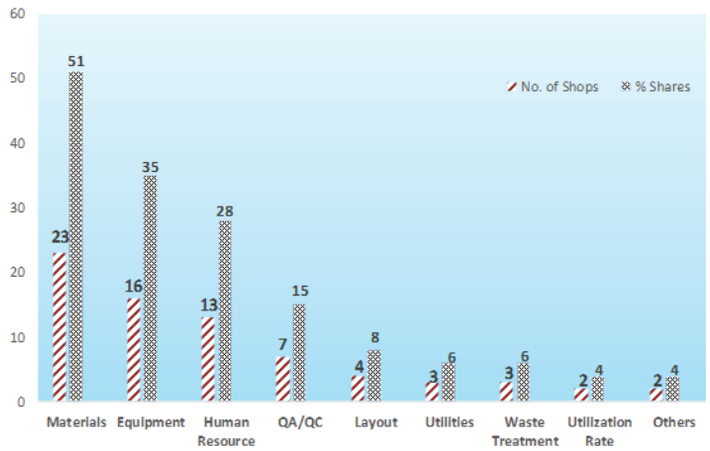

Figure 16. Production Issues and Concerns

Note: multiple answers

Table 24. Respondents' business expectations for the current year, 2016

2016 Business Expectation	Increasing	No Change	Decreasing	Depends Economic/ Political
Volume of business activity/production	19	11	8	7
Volume of Export Order Book	8	7	5	25
Volume of Import Order	7	7	2	29
Business Conditions	15	14	6	10
Average Selling Price	12	17	5	11
Number of People Employed	9	21	4	11

Table 25. Future actions for the next 5 years (2017 to 2021)

2021 Business Expectation	Increasing	No Change	Decreasing	Depends Economic/ Political
Volume of business activity/production	25	7	2	11
Volume of Export Order Book	11	8	0	26
Volume of Import Order	9	6	0	30
Business Conditions	18	13	2	12
Average Selling Price	18	11	3	13
Number of People Employed	21	9	2	13

Expectation/Future Actions of the Establishment:

Several respondents were experiencing hardships in maintaining enough supply of raw materials, sustaining equipment maintenance, maximizing utilization rate, and updating the skills of human resources, among others. Despite all of the present issues and concerns, the respondents were able to stand firm and remain optimistic that the business will rise and will bring a good market which may lead to a higher profit. Table 24 reflects that in terms of volume of business activity/production, volume of export order, volume of import and business conditions for the current year, 'increasing' has the most number of responses while in terms of average selling price and number of people employed for the current year, 'no change' had the most number of responses. Unlike in Table 24, Table 25 presents that majority of respondents' business expectation in terms of volume of business activity/production, volume of export order book, volume of import order, business conditions, average selling price, and number of people employed for the next 5 years from 2016 to 2021 business establishment will continue to flourish. Some said that the future of business will always depend on the economic and political stability of the country.

Shop Owners Expansion Plans:

Companies always face new challenges as they attempt to grow and expand their business. Tables 26 and 27 indicate that some of the company owners are hesitant to expand their business horizons for the current year and for the next 5 years. Their vision is to proceed with stability considering their market and expansion of products. The owners want to concentrate in the improvement of business areas, such as product quality, technical capability in terms of providing training in the specific needs of their personnel (e.g. program in the cast iron production, microstructure, analysis) Others are still considering the trends of the business.

Programs of the government specifically in terms of finances have an impact on businesses especially those planning to expand their business horizons. The study disclosed that not all metalcasting respondents were aware of the government program specifically the Department of Science and Technology's (DOST) Small Enterprises Technology Upgrading Program (SET-UP). Only 13 percent of the respondents were aware of the programs while 7 percent availed the program. Two companies who availed the program were situated in Region 6 and the other in Region 7. This SET-UP program is a strategy to encourage and assist MSMEs in adopting technological innovations to enhance operational efficiency and boost productivity and competitiveness. The program aims to empower firms to address technical problems through technology transfer and technological interventions. The SET-UP is one of the government initiatives launched by the Department of Science and Technology in response to the former President Arroyo's call for more focused assistance programs for MSMEs. As of 2017, DOST SETUP has assisted many small companies.

Table 26. Shop owners expansion plans for the current year

Expansion Plan	With plan to expand	No plan to expand	Depends on economic/political situation
Set up additional branch	4	30	11
Increase product lines and services	15	14	16
Increase technical capacity (e.g. purchase equipment)	19	14	12

Table 27. Shop owners expansion plans for the next 5 years

Expansion Plan	With plan to expand	No plan to expand	Depends on economic/political situation
Set up additional branch	8	21	16
Increase product lines and services	15	12	18
Increase technical capacity (e.g. purchase equipment)	19	9	17

INITIATIVES:

Private Sector

Industry Association

- Philippine Metalcasting Association, Inc. (PMAI).
  The PMAI is an active organization of metalcasting industry players, enthusiasts and academe, which is instrumental in the continuous existence of the sector.
- Universities & Technical Schools Offering Metalcasting and Metallurgy.

Government Sector

SET-UP is a nationwide strategy to encourage and assist MSMEs in adopting technological innovations

to enhance operational efficiency and boost productivity and competitiveness. This is the response of the **Department of Science and Technology (DOST)** for more focused assistance programs for MSMEs. The program aims to address technical problems through technology transfer and technological interventions.

Under the DOST, various services and metal-casting facilities and metalworking related infrastructure provided by the **Metals Industry Research and Development Center** directly supports the metals, engineering and allied industries to enhance its competitive advantage with the provision of 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 advisory services.

Investment Incentives are also offered by the Department of Trade and Industry through the **Philippine Economic Zone Authority (PEZA)**. It promotes investments, extends assistance, registers, grants incentives and facilitates the business operations of investors in export-oriented manufacturing and service facilities inside selected areas throughout the country proclaimed by the President of the Philippines as PEZA Special Economic Zones[6].

Other training institutions also provides technical training such as:

- The **Technical Education and Skills Development Authority (TESDA)** is the study of technologies and related sciences and acquisition of practical skills relating to occupations in various sectors of economic life and social life comprises formal (organized programs as part of the school system) and non-formal (organized classes outside the school system) approaches. (UNESCO)[7].

  It oversees and administers incentives to developers/operators of and locators in world-class, ready-to-occupy, environment-friendly, secured and competitively priced Special Economic Zones[8].

- **Dualtech Center,** a project of **Dualtech Training Center Foundation, Inc. (DTC-FI)**, is a not-for-profit technical-vocational school preparing young people for employment in industrial firms. Through the Dual Training System, the school collaborates with several business entities to impart relevant skills and values to high school graduates. Dualtech Center is committed to contribute to the common good by developing people through the Dual Training System to become trained, skilled, productive, enlightened and morally upright persons fulfilling the needs of the industry and the communities we serve.[9]
- **Meralco Foundation, Inc. (MFI)** - From being an investment holding company in 1973, MFI evolved into its true purpose as a fully operating educational foundation that provides funding and vocational-technical education to Filipinos. The foundation implements this mission with its operating arm, the MFI Technological Institute (formerly referred as the Meralco Foundation Institute), with its flagship programs: the Industrial Technician Program (ITP), a post-secondary, non-degree course; and the MFI Training, Technical Short Courses, Agricultural/Agri-preneurship Programs and Human Resource Development Programs.[10]
- The **Department of Trade and Industry (DTI)** through the **Board of Investment (BOI)** has this **Investment Priorities Plan (IPP)**. The President of the Philippines issued Memorandum Order No. 12 dated 28 February 2017 approving the 2017 IPP as a key in making growth more inclusive and poverty-reducing. Some of the highlights of the 2017 IPP which may be addressed by the Metals and Engineering Industries are given in Annex D (Incentives for BOI-Registered Enterprises).

6 www.tesda.gov.ph/About/TESDA/28
7 www.peza.gov.ph
8 En.wikipilipinas.org/index.php/Dualtech_Training_Center
9 https://www.mfi.org.ph/about-us/history/
10

A. Omnibus Investments Code of 1987 (E.O. No. 226)
   1. Income Tax Holiday (ITH)
      a. Six (6) years for projects with pioneer status and for projects located in a Less Developed Area (LDA);
      b. Four (4) years new projects with non-pioneer status;
      c. Three (3) years for expansion/modernization projects.
   2. Duty exemption on imported capital equipment, spare parts and accessories;
   3. Exemption from warpage dues and any export tax, duty, impost and fees;
   4. Tax exemption on breeding stocks and genetic materials;
   5. Tax credit on imported raw materials;
   6. Tax and duty-free importation of consigned equipment;
   7. Additional deduction for labor expenses;
   8. Employment of foreign nationals;
   9. Simplification of customs procedures; and
   10. Access to bonded manufacturing warehouse.

B. Philippine Mining Act of 1995 (R.A. No. 7942) Incentives under E.O. No. 226, unless specified in the Specific Guidelines, and the following:
   1. Exemption from real property tax and other taxes or assessments of pollution control devices;
   2. Income tax-carry forward of losses; and
   3. Income tax-accelerated depreciation.

C. Renewable Energy Act of 2008 (R.A. No. 9513)
   1. Income tax holiday (7years);
   2. Duty-free importation of RE machinery, equipment and materials;
   3. Net Operating Loss Carry-Over (NOLCO)
   4. Corporate tax rate of 10% after ITH;
   5. Accelerated depreciation;
   6. VAT-zero rate on sale of fuel or power generated;
   7. Cash incentive for missionary electrification;
   8. Tax exemption of carbon credits; and
   9. Tax credit on domestic capital equipment and services.[11]

DISCUSSION

1. The current workforce of the metalcasting industry is about 3,554 in 44 foundry companies (with 75% as direct workers and 5% as contractual workers). In the 2003 study, the total workforce is 3,528 in 46 metalcasting companies.
2. The needs of the metal casting industry in terms of capacity and capability requirements:
   a. As to the major equipment of the metalcasting processes, the two common equipment used are the induction and crucible furnaces. 48 induction furnaces and 46 crucible furnaces are disclosed with 33 responses out of 46 expected respondents. Centrifugal and vacuum casting machines which are used for jewelry castings and other microfoundry applications, are also cited by some respondents.
   b. The technical capability still needs intervention as 63% of the metalcasting workforce have formal training as indicated in page 8.
   c. Top issues and concerns in Figure 16 shows sourcing of raw materials, such as no adequate supply of good quality, inferior quality in the market, equipment runs second with the industry with poorly maintained equipment. Third issue is the human resource skills and technical know-how.
3. As to the plans of local metal casting shops, company respondents were hesitant to expand their business horizons for this year and for the next five years. Their decision is to proceed with stability of their market and expansion of products. They are to concentrate in the improvement of their product quality and level up technical capability through training in the specific needs of their personnel such as cast iron production, preparation on the microstructure, and analysis. These could be addressed by the government as well.
4. Statistical analysis of the 2014-2016 data on import and export statistics of metal casting commodities which could determine the growth or decline of the industry is stated in the market profile. The import figure reflected in Figure 10 showed a decrease in 2015 but a substantial rise

11 boi.gov.ph/files/draftipp2017

in 2016 by almost a billion dollar while the export data showed a fluctuating effect, that reached 960 million dollars in 2015 and dropped to 763 in 2016. There is a higher demand as reflected in the import and export data. When local industry players focused their attention to these opportunities, local importers will be encouraged to acquire their metal products requirements from local manufacturers. Top export commodities in 2016 where stator with windings and machined die-cast rotors, and enameled iron for household articles; ships or boats propellers and blades, and tyres for crane trucks and clutches and shaft couplings.

5. Some important points to be noted are:
   a. The shortage of skilled workers has to be addressed by the training institutions especially the government operated training centers for metalcasting. Another solution to this problem is for the government to provide a Foundry Institute in this country.
   b. The metalcasting sector still have problems on the supply of raw materials, as there were shortages in the supply of metals in most of the sectors of the metalworking industry in the past.
   c. The large-sized companies are capable of making investments to maintain their global competitive position, but the small and medium–sized companies across the metalcasting sector in the metalworking industries are not capable of making investments just to maintain and push upward for a competitive position.
6. The focus group discussion (FGD) was held to validate the results of the study at the MIRDC for the metalcasting sector. Specifically, industry's insights on the various concerns of the respondents were queried; made stronger the recommendation of the results gathered during the said study; and finalized the 2017 industry study on metalcasting for publication and distribution. The president of Philippine Metalcasting Association, Inc. Mr. Jerry Hui discussed the concerns of the metalcasting industry association as shown below.
   a. The price hike of raw materials that could be brought down by the potential scrap materials due to the phase-out of old jeepneys.
   b. The request for government intervention in reducing cost of raw materials.
   c. The sourcing of raw materials particularly scrap metals to be used by the foundry companies.
   d. Need for training of metalcasting personnel.

CONCLUSION

The local metalcasting industry is comprised of 59% small-sized companies, with 85% of the corporation conducting manufacturing and at the same time accepting jobbing orders. Moreover, browsing over the current production statistics, the industry is basically dominated by large and medium companies with 96% produced. By combining the total annual production of micro, small and medium is simply equal to about half the Total Annual Production of the large-sized companies.

As to the human resource capability: the personnel who have formal training exceeds the personnel without formal training, at least for the positions such as foundry technicians and machine operators. The efforts made by company managers and the training institutions are very commendable, and if these continue to increase, the industry will experience a breakthrough in quality and in mass production.

The industrial machinery and agricultural sectors were the most served sub-sectors by the metalcasting industry. The automotive sub-sector is third for the most served sectors. These three subsectors would be the most affected if the metalcasting industry fails to recover from its downfall trend.

The market was very competitive as perceived by the respondents coupled with problems on raw materials, high cost of electricity and regulation in foundry facilities/equipment as well as on workforce, raw materials and equipment. Some owners of foundries do minimal operation of their shops and import cast products serving as distributors for bigger earnings. Despite the negative comments, majority of the metalcasting respondents were optimistic about the future of the industry. Improving business environment is seen based on the observations of the respondents in the last years. Positive outlook is also evident as more respondents were having expansion plans within the year and even for the next five years through addition of product lines and equipment acquisition.

RECOMMENDATIONS

1. Invigorate the metalworking associations including the Philippine Metalcasting Associations, Inc. (PMAI) by conducting motivational and awareness programs with respect to the use of strategic planning, quality and production control as well as economic and environmental requirements of the various government agencies without cost in their part as incentives.

2. Through the FGD, the PMAI through Mr. Jerry Hui, PMAI president, proposed that phased-out jeepneys be turned over by the government to the metalcasting industry to be the source of reduced price of raw materials in foundries. Once the metalcasting companies were able to melt the metal parts of phased-out jeepneys, it will result to a lower price of metal raw materials.

3. Owners of bulk amount of unused, inaccurate metal machines and structures should be motivated to sell and gain from these useless materials. That these unused metals be utilized by PMAI for further melting and new castings.

4. Provide common facilities or possible time-sharing of equipment.

5. Provide assistance to companies that are willing to comply but have minimal fixed capital.

6. There is a need for more focused training programs in skills enhancement, quality product improvement and assistance with technology upgrading.

7. There is a plan to establish a Foundry Institute at the Center. It will solve various issues that are faced by many companies in the metalcasting business. This proposed facility which will implement focused programs in Metallurgy and metalcasting technologies will make substantial impact to the metalcasting industry.

List of Potential Metalcasting Company Respondents

1	New Anchor Foundry Shop Co.	NCR
2	Gold Star Foundry, Inc.	NCR
3	ASA Metal Products Inc.	NCR
4	Kim Yek Engineering and Foundry Co.	NCR
5	Precision Foundry of the Philippines, Inc.	NCR
6	Makati Foundry, Inc.	NCR
7	Grand Engineering and Foundry Corp.	NCR
8	Qamtis Phils., Inc.	NCR
9	Philippine Aluminum Wheels Inc.	NCR
10	Metals Industry Research and Development Center	NCR
11	SOH Technologies Corp.	NCR
12	La Suerte Metalcasting and Machinery Corp.	NCR
13	Triple E Metal Products Co.	NCR
14	METMA Trading and Industrial Corp.	NCR
15	Maysan Casting Corporation	NCR
16	Tiger Machinery and Industrial Corporation	NCR
17	Caster Metal Products	NCR
18	Rostech Foundry and Forging Inc.	NCR
19	Arty Ferrocast Inc.	NCR
20	Natomo Manufacturing Co.	Reg. I
21	Philgerma Manufacturing, Inc.	Reg. I
22	Citizen Machinery Philippines Inc.	Reg. IV-A
23	Metals Engineering Resources Corporation	Reg. IV-A
24	EN Corporation	Reg. IV-A
25	Castem Philippines Corp.	Reg. IV-A
26	Works Bell Phils. Inc.	Reg. IV-A
27	Creative Diecast Phils. Corp.	Reg. IV-A
28	RAS Golden Machinery Corp.	Reg. IV-A
29	FVC Philippines, Inc.	Reg. IV-A
30	Metalcrest Technologies Inc.	Reg. IV-A
31	Negros Metal Corp.	Reg. VI
32	R.U. Foundry and Machine Shop Corporation	Reg. VI
33	Victorias Milling Company	Reg. VI
34	Pert Inc./Foundry Division	Reg. VII
35	San Gabriel Metal Concepts Inc.	Reg. VII
36	Yasaka Phils. International Corp.	Reg. VII
37	Makoto Metal Technology Inc.	Reg. VII
38	Suarez and Sons, Inc.	Reg. VII
39	Castalloy Technology Corporation	Reg. VII
40	Suarez Brothers Metal Arts, Inc.	Reg. VII
41	Bato International	Reg. VII
42	Pacific Traders	Reg. VII
43	Cuadro Metal Casting Corporation	Reg. VII
44	United Casting Foundry Inc.	Reg. VII
45	MA Foundry Inc.	Reg. XI
46	De Guzman Enterprises	Reg. I

Additional List of Metalcasting Companies

1	Alta Machineries	NCR
2	Angbil Foundry Shop	NCR
3	Cebu Iron Foundry Corp.	VII
4	Cura Engineering	NCR
5	Fabricast Industries, Inc.	NCR
6	Falcon Metal Corp.	NCR
7	Jiswell Casting Corp.	NCR
8	Karuhatan Metalcasting & MS	NCR
9	New Asia Foundry & Manufacturing	NCR
10	Precision Machinist	VII
11	Acetech Metal Ind. Corp.	NCR
12	Baronesa Metal Corp.	VI
13	D.F. Gascon	NCR
14	DBC Machineries	X
15	First Asian Metal Corp.	X
16	Frisco Foundry	NCR
17	Maitland-Smith Cebu, Inc.	VII
18	Malanday Machinery	NCR
19	Progress Foundry Industries	NCR
20	Laguna Mett	IV-A
21	Nidec Phils.	IV-A
22	Fujimold	IV-A
23	Dynamic Castings	VII
24	Bataan Peninsula State University	III
25	Kimbee Machinery & Foundry	NCR
26	JMS Metalcasting	NCR
27	Virgo Metalcasting	NCR
28	Concord Metals	NCR
29	Datuin Machineworks	I
30	RB Yanson Resources, Inc.	VI

Closed

1	New Unity Foundry & Machine Shop	IX
1	Asia Metal Products Inc.	IV-A
1	Kastiron Foundry & Machine Shop	NCR
1	Multi-cast Iron, Inc.	NCR
1	Progressive Metal Resources, Inc.	NCR
1	Mary Check Trading	IV-A
1	Sanford Corp.	NCR

Stop

1	Lepanto Mining	CAR

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