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The light engineering industries of the Philippines

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Introduction

The engineering industry of the Philippines, although still in its development stage, is involved in a wide range of processes and products and accounts for about 11 per cent of the value of Philippine manufactures and about 2.6 per cent of the GDP. There are thousands of different engineering products reflecting a wide variety of sizes, designs, constructions, qualities and styles.

The engineering industry of the Philippines is primarily concerned with forming machine components and other useful products from metal. It essentially produces equipment components and maintains equipment for all of the productive sectors of the economy. These manufacturing activities range from straightforward metal fabrication, casting and machining to the assembly of finished equipment. Consequently, the industry can produce an almost infinite variety of products. Specialization has not, however, been achieved except in larger companies and a few small ones, owing to the highly fragmented market.

While production is mainly intended for the domestic market, export markets have been developed to a limited extent for some items of durable goods such as sewing machines, bicycles and pumps.

The country depends heavily, however, on imported industrial machinery, including that for the mining, iron and steel processing, metalworking, machine tools, cement, electric power, paper and textile industries.

Other imported features of the engineering industry are its linkage between products and processes and its ability to supply other industries with specialized goods. Different products that are turned out by the same plant are linked together; on the other hand, different establishments may be associated because they manufacture sub-assemblies or components that make up a single finished product.

In the Philippines, there is much subcontracting by enterprises in the engineering industry. It is carried out at various levels, so that primary subcontractors may let out some of the items they need to smaller subcontractors. A large volume of machining work is being let out by metal manufacturers, machine shops, appliances, agriculture and the transport

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industries. Aside from machining, most machine shops farm out castings, plating and fabrication jobs, in that order. The manufacturers of metal parts subcontact most plating, casting and heat treatment jobs. There is much subcontracting in the automotive industry for items such as brake linings, disc brakes and exhaust systems.

In the appliance industry, some heat-treatment, enamelling, casting, pressing, blanking and machining jobs are done externally. Most jobbing foundries produce rough or machined castings to be assembled with other components to produce a certain unit. Most subcontracting is carried out by job shops, which usually have a considerable amount of underutilized machinery.

The principal raw materials used in the industry are sheets (base metals and coated metals), plates, bars and rods, wires, pipes and tubes, tool steels and welding rods. Most of these basic products were originally imported, although there has always been a significant production of reinforcing bars and other billet-derived products as well as products cast from locally available scrap. At present, the percentage share of local production to total consumption of these intermediates is greater than the percentage share of imports.

Status of the engineering industry

The development of metal-products manufacture started with small ironworks, machine shops or foundries making replacement parts, gradually progressing into the production of ordinary metal products such as nails, wire and sheet-metal products, finally shifting to a more diversified production of other and more complex products. At present, there are a total of 2,005 enterprises engaged in metal-products manufacture dispersed thoughout the country. About 91 per cent of them are concentrated in the main island of Luzon.

The distribution of engineering firms according to their activities is given in table 1, and the annex contains a breakdown of the activities.

TABLE 1. DISTRIBUTION OF FIRMS ACCORDING TO ACTIVITY

Industry sector	*Number of establishments*	*Proportion of total (percentage)*
Service	947	47
Manufacture of metal products	692	35
Machine tools	51	3
Farm machinery and equipment	97	5
Transportation equipment	58	3
Appliances	31	2
Power-engine machinery	17	1
Construction and mining machinery	8	–
Electrical machinery and electronic equipment	29	1
Food-product machinery and equipment	23	1
Textile and machinery	29	1
Chemical-processing machinery	23	1
Total	2 005	100

The typical machine shop is highly diversified in its production and services rendered. Its products include components or replacement parts such as pins,

bolts, gears, shaftings, bushings and valves. Engine reconditioning refers to the rebuilding, refacing, reboring, sleeving and resizing of automotive, marine and stationary engines. Among the industries served are the logging, electrical, mining, textile, cement, glass, oil-refining, industrial chemical, paper, food processing, sugar, grain-milling and containers branches.

The machine tool sector is still in its early stages of development. Most of the companies involved in it produce machines for their own use and repair or assemble a limited number of machine tools such as lathes, drills and shapers. There are about 14 pioneering manufacturers of machine tools. Although this industry is still young, the production of tools, dies and jigs has been developed to a greater extent. Several manufacturers, who are usually small subcontractors, have acquired the capability to fabricate quality tools.

The manufacture of electrical equipment is gaining headway. This sector concentrates on prime movers (motors) and power-transmission equipment such as transformers and switchgear. At present, only fractional horsepower motors are produced in fairly large quantities. They are used for electric fans, air conditioners, blowers and the like. A few firms also produce appliances, distribution and power transformers, switches, fuses and electrical lamps.

Most food processing, textile and shoemaking equipment is imported. Only small components such as replacement parts for processing mills are fabricated locally. Bakery equipment such as mixers and bread slicers are batch produced by several firms. Similarly, only spare parts of equipment in the chemical-processing sector are locally manufactured. Fabricated parts are mostly moulds for rubberworking and plastic injection-moulding machines.

Some agricultural machinery and implements of various capacities and models, suitable for different seasons and farming practices, are locally manufactured. Manufacturers of power or hand tractors, grain dryers and the like are scattered throughout the country. The transport industry sector is presently being developed to become a major part of the engineering industry. Hundreds of jeep and truck body-builders are operating in almost every part of the country on a jobbing basis, but a few firms also manufacture on volume scale. Bicycles and pedicabs are being manufactured and fabricated in comparatively large volumes.

Appliance manufacturers are mostly engaged in semi-mechanized operations. There are a few large manufacturers of refrigerators and air conditioners and several medium-sized producers specializing in the fabrication of such equipment, particularly centralized-type air conditioners. There are also manufacturers of other appliances such as electric irons, electric fans and sewing machines.

Pumps of different makes and capacities are usually fabricated by medium-size firms. Centrifugal pumps of common types are being produced, ranging in capacity from a few litres to about 800 litres/min. The local manufacture of construction machinery is also limited. The items being manufactured include replacement parts for tractors, earth-moving, materials handling and rock agreggate processing machinery. Smaller fabricators produce concrete and mortar mixers and hollow-block-making machines. Electric arc and gas welding equipment are also produced domestically.

The manufacture of metal products involves a great variety of items, of

which the ironworks producers represent a large proportion. There are many fabricators of iron grilles, doors, windows and frames. Most of them are small enterprises.

Manufacturers of cutlery are concentrated in the Bicol region of Southern Luzon island.

Numerous furniture, fixtures and hardware products including hand-tools, garden tools and edge tools, are locally produced by blacksmith shops. In nearly every region of the country there are centres of manufacturing for simple tools used in agriculture, carpentry and metalworking.

Steel wires are locally fabricated into many articles for a wide variety of uses, such as nails, springs, hoops, rivets, fencing materials, screens and a host of others, each of which consumes large amounts of wire.

To date, the engineering industry has a total employment of about 49,500 workes distributed throughout all parts of the country. Firms with fewer than 10 employees account for about 65 per cent of the total number of firms in the industry, while those with more than 500 employees account for only about 1 per cent. Table 2 presents the distribution of engineering establishments by number of persons employed. The great majority of the workers employed in the industry are semi-skilled.

TABLE 2. DISTRIBUTION OF EMPLOYMENT IN THE ENGINEERING INDUSTRY

Employment	*Number of establishments*	*Number of persons employed*	*Average number of workers*
Less than 10	1 249	4 754	4
10–19	205	2 860	14
20–49	249	7 473	30
50–99	101	6 893	68
100–199	59	8 172	138
200–499	28	6 946	248
Over 500	16	12 422	776

Capitalization

Although the engineering industry is generally labour intensive, it may be capital intensive in certain cases. Table 3 shows that about 72 per cent of the firms have capitalizations of less than 50,000 Pesos (P). These firms are classified as small-scale. The overall picture is therefore that of a highly diversified industry with many small-size firms, making a wide variety of products.

TABLE 3. FIRM DISTRIBUTION ACCORDING TO CAPITAL

Capitalization (Pesos)	*Number of firms*	*Percentage distribution*
50 000	1 445	72
50 000–100 000	189	9
100 001–500 000	221	11
500 001–1 000 000	58	3
Over 1 000 000	92	5
	2 005	100

Employment

The engineering industry consists of extremes: the large, well-organized establishments and the small, one-owner operations. With few exceptions, the large plants are generally well managed; they have adequate facilities and they manufacture metal products that conform to standard specifications. Very few of the small-sized individual firms have the financial resources to employ engineering designers and professional production, metallurgical or quality-control personnel. Most of these companies have been founded and managed by one person who may be an engineer, an entrepreneur or skilled worker who, through the years, has learned the rudiments of the trade. It is common, especially in small shops, for the manager-owner to take charge of technical, managerial and business matters, sometimes functioning as a production worker as well. A number of plants, however, employ supervisors, foremen, clerical, workers, engineers, and the like to maximize productive efficiency.

Some of the larger firms are related to transnational corporations as licensees, partners or wholly owned subsidiaries. In this way these local firms are provided with the technical assistance in plant organization and product engineering support initially needed.

Local production

An assessment of the engineering industry shows that it is largely composed of small-scale enterprises essentially engaged in jobbing and low-volume order activities. Most of these small-scale establishments can be classified under the service industry and manufacture of metal products sectors. The engineering industry in the Philippines can therefore be considered as still being essentially in the light engineering stage.

A certain degree of manufacturing sophistication has been achieved in certain sectors as in the automotive and appliance industries. Despite certain drawbacks, including technological, financial and marketing problems, local production has increased from about P 838 million in 1971 to approximately P 2,021 million in 1975. The construction, appliance, transport, power and mining industries have been responsible for much of the growth of the engineering industry. The growth of industrial activity in recent years has generated much of the expansion that took place within the industry.

Status of the light engineering industry

The Philippines has a comparatively short industrial history. At present, the development of its light engineering industry is beginning to level off because production has been principally oriented toward import substitution. In addition, the limited size of the domestic market frequently results in idle capacity, inadequate scales of production or too great a diversification of production. The lack of opportunity for specialization has brought about various technological problems.

In this paper, the light engineering industry is broadly classified into metalworking (pressing, forging, rolling etc.), metalcutting (machining) and casting (foundry).

Metalworking and fabrication firms

The manufacture of metal products through metalworking and fabrication involves a great variety of items. The ironworks, welding shops and press shops represent the largest in terms of firms, and most of them belong to the small-sized enterprises. Some products included under metal-products manufacture are: iron and sheet-metal works; wire and wire products; hand tools; hardware; metal fasteners; furniture and fixtures; lighting and plumbing fixtures; safes, vaults and storage cabinets; cutlery; kitchenware and appliances; ornaments; hospital equipment and supplies; tin-plate containers; springs; ordnance; and other miscellaneous metal articles.

The demand for metal products is confined to the domestic market. The metalworking and fabrication sector is generally supported by the construction industry, the commercial sector, the manufacturing and the household sectors. Local production of metal manufactures increased from P403 million in 1971 to about P731 million in 1975.

In some parts of the country, there are centres of manufacturing that specialize in the production of such specialized metal items as cutlery. The Philippines has achieved a certain degree of technical proficiency in being able to meet about 55 per cent of the total requirements for metal manufacture. Local manufactures, however, still suffer from competition from imports because of certain technical and financing problems.

Establishments engaged in metal manufacture, which grow at an average rate of 15 per cent yearly, accounted for about 70 per cent of the total number of firms in the engineering industry. These plants and workshops are generally concentrated in major cities and towns in the country.

A classification of firms engaged in metal manufactures based on the number of employees is shown in table 4. As a measure of size, the majority of firms (65 per cent of the total) belong to the small-scale enterprises employing only 1 to 20 persons. About 7 per cent of the firms are considered medium-to large-scale employing over 100 persons.

TABLE 4. EMPLOYMENT DISTRIBUTION

Employment (persons)	*Number of firms*	*Percentage distribution*
1–20	456	66
21–100	187	27
Over 100	49	7
Total	692	100

Machine shops

Existing machine shops in the Philippines are basically jobbers, engine rebuilders, fabricators and small-scale subcontractors. They cater to nearly all sectors of industry.

At present, there are about 873 machine shops in the country and about 121 engine reconditoners, making them together the largest group in the engineering industry, representing about 60 per cent of the total number of

establishments. These are mostly small, open-front shops in industrial centres, lining the roads and servicing numerous industries. Most of these shops have five general-purpose machines for undertaking machining, drilling and welding jobs. Their products, however, depend on the needs of their customers. Most worn-out parts of machines are brought to these shops for copying and fabrication, although certain standard items are made in small quantities. These machine shops are primarily engaged in the repair and maintenance of practically all types of machinery and industrial equipment, motorized and non-motorized vehicles, and electrical and non electrical machinery, and in the fabrication or duplication of machine parts based on imported models and customers' designs.

The performance of these machine shops, as measured by the total earnings of the firms, averaged about P65 million in the five-year period 1971–1975. Their share of the total engineering industry output was maintained at about 5 per cent. Historically, the machine shops represent a small-business industry. Firms with fewer than 10 employees account for about 77 per cent of the total number of firms, while those with over 20 employees account for only about 5 per cent.

Foundries

Cast metals play an essential part in the Philippine economy, specifically in meeting the requirements of equipment, machinery and spare parts manufacture. To date, 147 foundries are engaged in the production of various cast products. Most of them are geograhically concentrated in Metro Manila and account for 72 per cent of the total production of castings. Foundries have been in existence for the past three decades; the industry has continued to grow by expansion and proliferation. Most of them, however, are still manual in operation; only a few are semi-mechanized. With regard to their size distribution, about 37 firms, or 25 per cent, employ less than 20 workers, which account for only 4 per cent of total employment. There are 27 foundries that employ more than 100 workers; they constitute about 18 per cent of the total number of establishments but account for 59 per cent of total employment.

The range of products turned out by domestic foundries covers diverse applications as they are utilized by a wide range of end-user industries. Production in 1973 totalled 69,230 t, increasing to 99,200 t in 1976. Casting production showed notable gains owing to the increased activities in the agriculture, mining, transport and construction industries. These also gave rise to the emergence of new foundries to meet the increased demand for castings from the end-user industries. Production in the foundry industry was dominated by 24 firms which accounted for about 79 per cent of total output. The growth and development of the foundry industry has been linked to the progress and expansion of the country's major industries, such as mining, construction, transportation and agro-based industries. Domestic foundries usually turn out replacement parts of machinery and equipment, but some firms are now able to manufacture original components for the transportation, appliance and agricultural machinery industries.

Problems of the industry

Financing has always been a major problem of the industry, which is very much undercapitalized. Tight credit continues to restrain the business establishment from further expansion of their productive capacity. Such financial constraints as lack of equity capital and difficulties in securing loans have resulted in the inability of most firms to achieve an efficient production level. Working capital is almost always financed from internally generated funds, which are often inadequate. The need for more working capital is acutely felt by small entrepreneurs owing to lack of readily available loans. As a result, some firms prefer to continue with obsolete methods of manufacture rather than to modernize as to do so would require more investment.

The main technical and manufacturing problems of the industry are low-quality raw materials, lack of standards, frequent machinery breakdowns, faulty production scheduling, insufficient design knowledge and lack of proper tools and devices. Production planning and quality control are lacking in most establishments. These problems often hinder the production of precision parts and other high-quality products and the possibility of entering the export market.

The shortage of funds and workshop space and the restricted volume of orders usually prevent the entrepreneurs from purchasing specialized production machines. More often, it is necessary to switch from one type of product to another, and enterprises therefore maintain general-purpose machines.

Considerable ingenuity is developed in designing simple jigs, fixtures and tools and improvising machinery to carry out the multitude of processes encountered by the small-workshop entrepreneur. Sometimes the acquisition of a costly, sophisticated machine is technically required but its capital and operating costs are so high and its volume of production, so small, that it is uneconomic to acquire it.

The lack of well-trained workers is a perennial problem of the industry. Since it is basically labour intensive, the engineering industry's greatest asset is necessarily its trained work-force. Ironically, the industry suffers from shortages of qualified workers because of the limited training facilities available to it. In many cases, the workers develop only to the semi-skilled level; only large establishments have well-organized training programmes. Under such circumstances, many firms prefer to hire skilled workers developed by other companies, attracting them with higher wages.

There is substantial underutilization of capacity in the engineering industry owing to a variety of factors such as too many plants in too small a market, and shortages of raw materials, financing, skilled workers and skilled supervisory personnel. Lack of product diversification, deficient design and production engineering and the continued use of outmoded machinery are also limiting factors. This situation underscores the fact that a poorly utilized machine inevitably results in a high capital-to-output ratio.

Imported machinery sometimes cannot be used for lack of spare parts or skilled operators. This is a very serious problem, because the equipment manufacturer's representatives may respond to complaints only after long delay.

It sometimes happens that a machine that has broken down must be sent abroad for repair, owing to the absence of competent local mechanics or adequate maintenance facilities. Seriously affected are small and medium-scale manufacturers who may have borrowed heavily to invest in expensive machinery which, if idle, generates no income to pay interest on borrowed capital and wages to workers and office staff.

Annex

INDUSTRY CLASSIFICATIONS

Servicing

Machine shops
Engine rebuilders

Manufacture of metal products

Tin cans, metal closures and other tinware
Hand and garden tools
Edge tools
Handsaws and saw blades
Cutlery
Furniture and fixtures
Hardware
Ironworks
Sheet-metal work
Pressure tanks
Metal stamping
Metal fasteners
Lamps and lighting fixtures
Safes, vaults and cabinets
Wire and wire products
Steel springs
Ordnance
Extruded shapes
Office supplies
Ornaments and novelty items
Other metal products

Machine tools

Lathe machines
Metalworking press
Sawing and filing machines
Shearing and forming machines
Cutting tools, dies and jigs
Woodworking machinery

Farm machinery and equipment

Cultivating farm machinery
Harvesting and grain-processing machinery

Transportation equipment

Passenger automobiles
Trucks, buses and jeepneys

Shipbuilding, boatbuilding and ship repair
Motorcycles, bicycles and pedicabs
Material handling equipment

Appliances

Electric appliances
Washing machines
Sewing machines
Refrigeration and air-conditioning units

Power engine machinery

Pumps and compressors

Construction and mining machinery

Construction machinery parts
Mining machinery parts

Electric machinery and electronic equipment

Motors
Transformers
Electrical distribution and control apparatus
Welding machinery and equipment
Electric lamps
Transistors
Batteries and parts, such as grids and plates

Food-product machinery and equipment

Bakery equipment
Food-processing machinery
Coconut-demeating machines

Textile and shoemaking machinery

Textile fabric machinery parts
Shoemaking machinery parts

Chemical-processing machinery

Plastic-working machinery parts
Rubber-working machinery parts
Cement-making machinery parts