Investment Opportunities in Odisha

Downstream Industries in Aluminium

ODISHA
NEW OPPORTUNITIES

With 54% of the total Aluminium smelting capacity of the country, Odisha presents an excellent opportunity for Ancillary and Downstream sector industries in the Aluminium sector to set up units in the State.

Ancillary and Downstream industry is a focus sector for the State. With the presence of large mother plants of Vedanta, Hindalco and NALCO in the State and dedicated locations identified at Angul and Jharsuguda for setting up Ancillary and Downstream parks, Odisha is the preferred destination for Ancillary and Downstream manufacturers in this sector.

Coupled with competitive cost of doing business and best- in class incentive framework, the State offers a compelling value proposition for units in the Ancillary and Downstream sector. To facilitate the investors in the sector, short profiles have been prepared with key features of various projects that an investor may consider to set up in the State. These project profiles provide information regarding the area required, approximate project cost, process, utility and manpower requirement which would assist the investors in the decision making process. This compendium provides information on 20 such select projects which could be considered for further due diligence by the investors.

I am confident that the investors, particularly in the MSME sector, will find this compendium of 'ready-to-set-up' project profiles useful.

Shri Naveen Pattnaik,
Chief Minister

Contents

1. Facility for manufacturing of Aluminium Die Casting

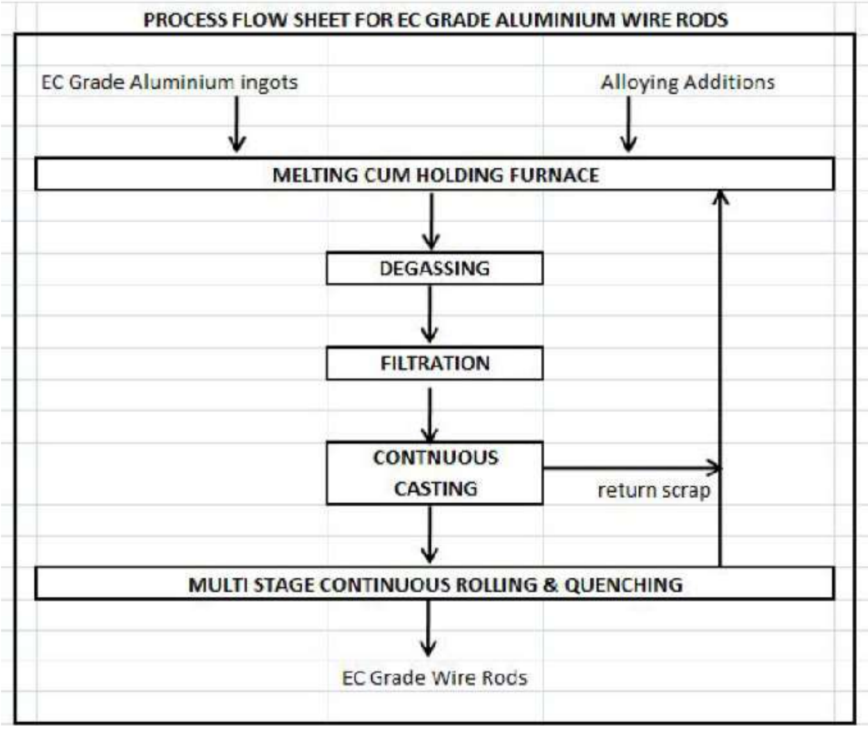
Name of Project	Facility for Manufacturing of Aluminium Die Casting
Area Requirement	2,500 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 2 – 4 Crores (at Angul)/ ~ INR 1 - 3 Crores (at Jharsuguda) b) Plant and Equipment : ~ INR 12 – 15 Crores
Project Scale	Capacity – about 510 to 520 tonnes per year
Process	In pressure die casting the molten metal is introduced under pressure into a metallic die and allowed to solidify to produce near-net-shapes. Two types of die casting machines known as cold chamber and hot chamber are usually used. Because of its high melting point, aluminium silicon alloy is die cast in cold chamber pressure die casting machine. In cold chamber operations the molten metal is usually maintained at constant temperature in an adjacent furnace, where transfer of successive shots to the machine chambers can be accomplished manually. Electrically heated types furnaces has been envisaged. During the process high pressure is applied, so lower molten metal feeding temperature is used. Metal for a single shot is loaded into a cylindrical chamber through a pouring aperture. As the piston forces metal into the die, the entire operation being completed in a few seconds, so that iron contamination is virtually eliminated. Using this technique much higher injection pressure in the range of 70–140 Mpa is feasible, enabling lower metal to be employed and greater intricacy achieved. Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants.
Utilities	• Electricity (Connected Load) – approx. 6 MVA • Water about 3 to 4 m3/ day • Compressed Air about 15 to 20 Nm3/min
Manpower Requirement	30

2. Facility for manufacturing of Aluminium Shots & Notch Bars

Name of Project	Facility for Manufacturing of Aluminium Shots & Notch Bars
Area Requirement	2500 sqm
Approx. Project cost	a) Land and Buildings : ~ INR 1.2 – 1.5 Crores (at Angul)/ ~ INR ~ 1 Crores (at Jharsuguda) b) Plant and Equipment : ~ INR 2 – 3 Crores
Project Scale	Capacity – about 500 tonnes per year
Process	The basic steps involved in the manufacture of Aluminium shots and Notch bars are as follows: (i) Melting (ii) Casting (iii) Grading (iv) Inspection and Testing Commercial grade Aluminium of 99% purity is suitable for manufacture of shots and notch bars. Alternatively, in case of using aluminium scrap, it should be properly segregated and subjected to magnetic separation to avoid iron contamination. Melting is carried out in fuel fired melting furnace of capacity 2T. Aluminium scrap and ingots are preheated to remove oil or moisture before introducing into molten metal. The melting is carried out under protective cover flux to avoid excessive melting bases. Aluminium shots are made by passing molten aluminium at a correct temperature through refractory coated vibratory sieve. The metal beneath the sieve is collected in a water tank with an arrangement for continuous circulation of water. The shots so obtained from the water tank are graded and oversized shots are sent for re-melting. Samples from a representative lot are sent for chemical analysis. The material conforming to the standards is weighed and packed. Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants. Auxiliary facilities such as lubrication systems, etc. will be part of the individual machines.
Utilities	• Electricity (Connected Load) – approx. 2 MVA • Water about 1 to 2 m3/ day • Compressed Air about 4 to 5 Nm3/min • File Oil - 80 kg/ t of casting
Manpower Requirement	20

3. Facility for manufacturing of Aluminium Wire Rod

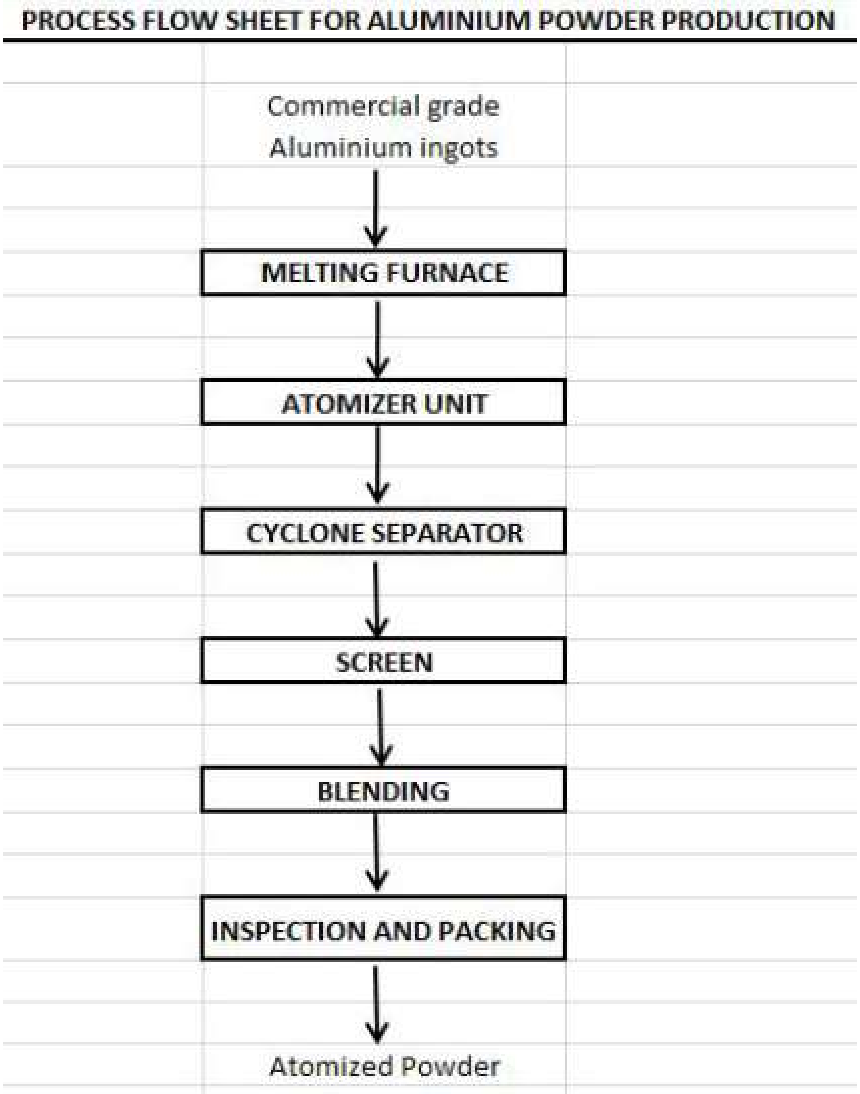
Name of Project	**Facility for Manufacturing of Aluminium Wire Road**
Area Requirement	4 to 5 acre
Approx. Project cost	a) Land and Buildings : ~ INR 5 – 8 Crores (at Angul)/ ~ INR 3 - 6 Crores (at Jharsuguda) b) Plant and Equipment : ~ INR 10 – 12 Crores
Project Scale	Capacity – about 500 tonnes per year
Process	Presently, only continuous casting and rolling process for production of aluminium wire rod is being followed by almost all producers. EC grade aluminium ingots are melted alongwith return scrap and suitably alloyed with Mg and Si to produce Al-Mg-Si alloy. The prepared metal is transferred into a tundish and thereafter into a mould for bar casting. Modern practices also involve an in-line metal refining system which comprises of a degasser and ceramic foam filtration unit. The metal should be absolutely free from entrapped gases and non-metallic inclusions. For achieving the same, continuous in-line metal refining system is adopted. The molten metal is properly fluxed and all dross is taken out of furnaces before transfer or casting of metal. Fuel can be LSHS or diesel depending upon the availability aspects. The furnaces used can be stationary type or tilting type depending upon the technological considerations. The rod casting machine is equipped with a metal transfer trough, a casting plate and a structure supporting the casting machine and the cast rod. Molten metal fed into the trough solidifies as a result of the cooling effect of the rotating wheel and covering steel band. An appropriate mechanism is adopted with the machine above the casting wheel to extract the cast bar from the wheel during operation. The emerging cast bar through a casting wheel has a trapezoidal cross-section. The surface of the casting wheel in touch with aluminium should be absolutely smooth and polished. The auto-lubrication of casting wheel is provided to keep the bars free from casting wheel during operation. The casting wheel and band are cooled by water spraying nozzles. The Casting water spray system is provided with auto back wash filter to clean the cooling water before entering into water spraying nozzles. PLC based recipe driven cooling water spray control is provided for alloy as well as EC grade wire rod production. The solidified rod leaves the casting wheel and passes onto the rolling line (properzi) having a number of rolling mill strands which reduce the size and shape of bar in stages and finally wire rod of 9.5 mm dia is produced. The wire rod further travels to the coiler and gets wound up as a coil having a weight around 2 MT each. A soluble oil emulsion system is provided to furnish cooling during the working of the cast bar to desired diameters. Emulsion filtration system is capable of separating aluminium fines, tramp oil and debris, if any. Fume / steam exhaust system is provided in emulsion pit for better working environment. A dual reel coiler is provided to produce dense level wound coils with minimum surface damage to the wire rod. Proper mechanism is provided to ensure compaction of coiled wire rod. Coils are transferred to operation floor level and finally to

Name of Project	Facility for Manufacturing of Aluminium Wire Road
	storage area using fork lift. The complete EC Rod manufacturing process has been shown in the process flow sheet below : Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants. 
Utilities	• Electricity (Connected Load) – approx.10 MVA • Water about 3 to 4 m3/ day • Compressed Air about 2 to 3 Nm3/min • File Oil - 80 kg/ t of casting
Manpower Requirement	18 to 20

4. Facility for Manufacturing of Aluminium Powder

Name of Project	Facility for Manufacturing of Aluminium Powder
Area Requirement	2,500 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 2 – 4 Crores (at Angul)/ ~ INR 2 - 3 Crores (at Jharsuguda) b) Plant and Equipment : ~ INR 15 – 18 Crores
Project Scale	Capacity – about 500 tonnes per year
Process	Commercial grade Aluminium of 99% purity is suitable for manufacture of aluminium powder for general applications. The metal is melted in furnaces and the temperature maintained is around 720 – 750 deg C. Subsequently, atomization is accomplished by forcing the molten metal stream through an orifice at moderate pressures. A air or gas is introduced into the metal stream just before it leaves the nozzle, serving to create turbulence and exits into a large collection volume exterior to the orifice. Air and powder streams are segregated using gravity or cyclonic separation. Simple atomization techniques are available in which liquid metal is forced through an orifice at a sufficiently high velocity to ensure turbulent flow. Other techniques such as nozzle vibration, nozzle asymmetry, multiple impinging streams, or molten-metal injection into ambient gas are all available to increase atomization efficiency and produce finer grains, to narrow the particle size distribution. The different sizes of aluminium powders are segregated by sieving. Then packing is done as per market requirement for specific quantity. The powder produced will meet standard specifications for air atomized powder and by using proper control equipment consistent quality of the product can be fully ensured with minimum losses. The quality control standards as per IS-438-2006 are to be followed.

Name of Project	Facility for Manufacturing of Aluminium Powder



Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants.

Utilities

- Electricity (Connected Load) – approx. 0.5 MVA
- Water about 2 to 3 m3/ day
- Compressed Air about 4 to 5 Nm3/min
- File Oil - 80 kg/ t of casting

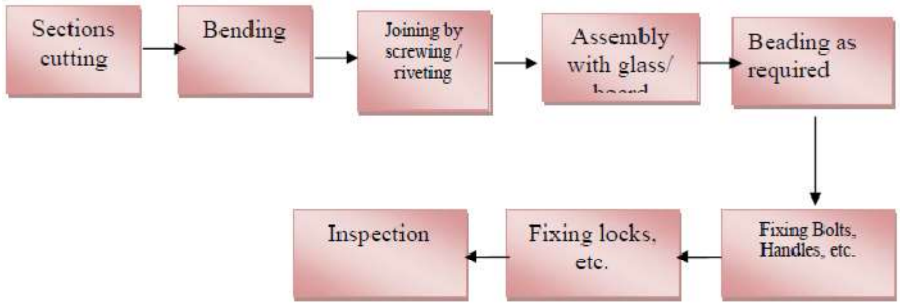
Manpower Requirement

25 to 30

5. Facility for Manufacturing of Caps and Closures

Name of Project	Facility for Manufacturing of Caps & Closures
Area Requirement	900 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 50 – 80 Lakh (at Angul)/ ~ INR 30 – 50 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 60 – 80 Lakh
Project Scale	Capacity – 50 million pieces/yr
Process	The process requires the printing of hard aluminium sheets as per the desired design requirements. The printed sheets are sent to the Punching machine, already fitted with multiple dies as per the design requirements. The final shapes of caps are obtained during operation of knurling as well as grooving of perforation. The circular washers are generally fitted manually on the caps as per requirement. In another operation, vial seals are also made through punching operation on raw aluminium sheets. Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants. In addition, the auxiliary facilities such as lubrication systems, etc. will be part of the individual machines.
Utilities	• Electricity (Connected Load) – approx. 10 to MVA • Water about Nominal
Manpower Requirement	20

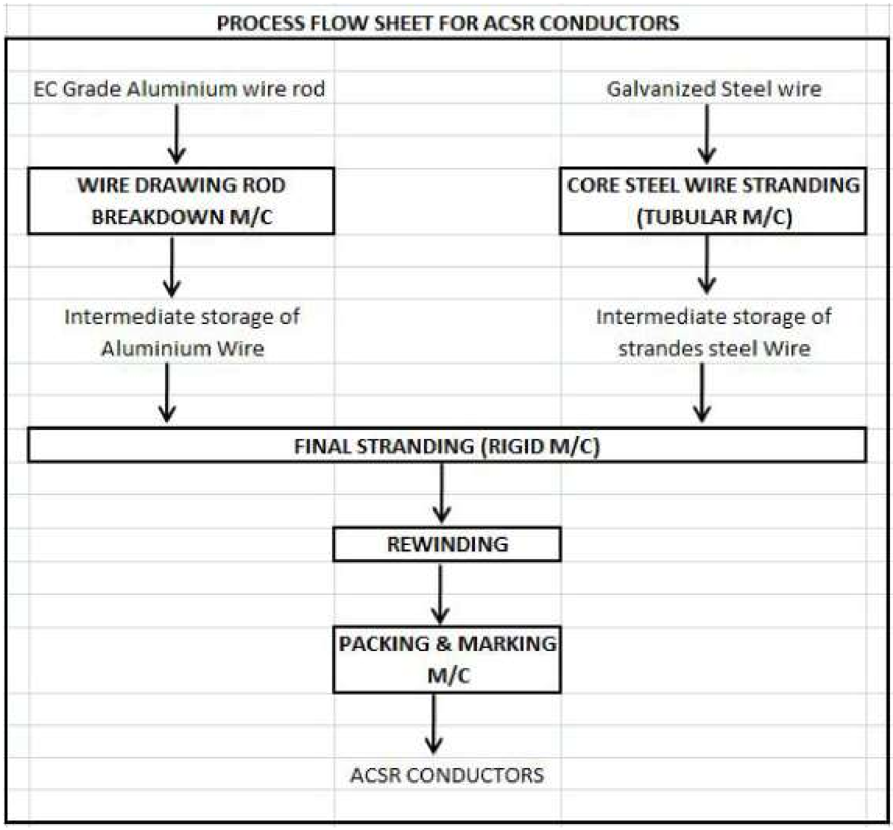
6. Facility for Manufacturing Fabricated Aluminium Products

Name of Project	Facility for Manufacturing of Fabricated Aluminium Products
Area Requirement	2500 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 80 – 90 Lakh (at Angul)/ ~ INR 50 – 60 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 70 – 80 Lakh
Project Scale	Capacity – 6000 sq m per annum
Process	The process comprises of receiving the desired sections (profiles) after anodizing through outsourcing. Subsequently, the anodized sections are subjected to fabrication by first measurement, sizing and cutting operations as per design. This is followed successive bending operations. The cut sizes are joined by screwing or riveting. This is followed by assembling with glass/board and beading wherever necessary. Thereafter the handles, locks, tower bolts, stoppers etc. are also fitted as per requirements. The packaging for safe handling and transport is subsequently carried out. The process flow diagram is shown below : 
Utilities	• Electricity (Connected Load) – approx. 8 to 100 Kw • Water Nominal
Manpower Requirement	20

7. Facility for Manufacturing of Aluminium Circles

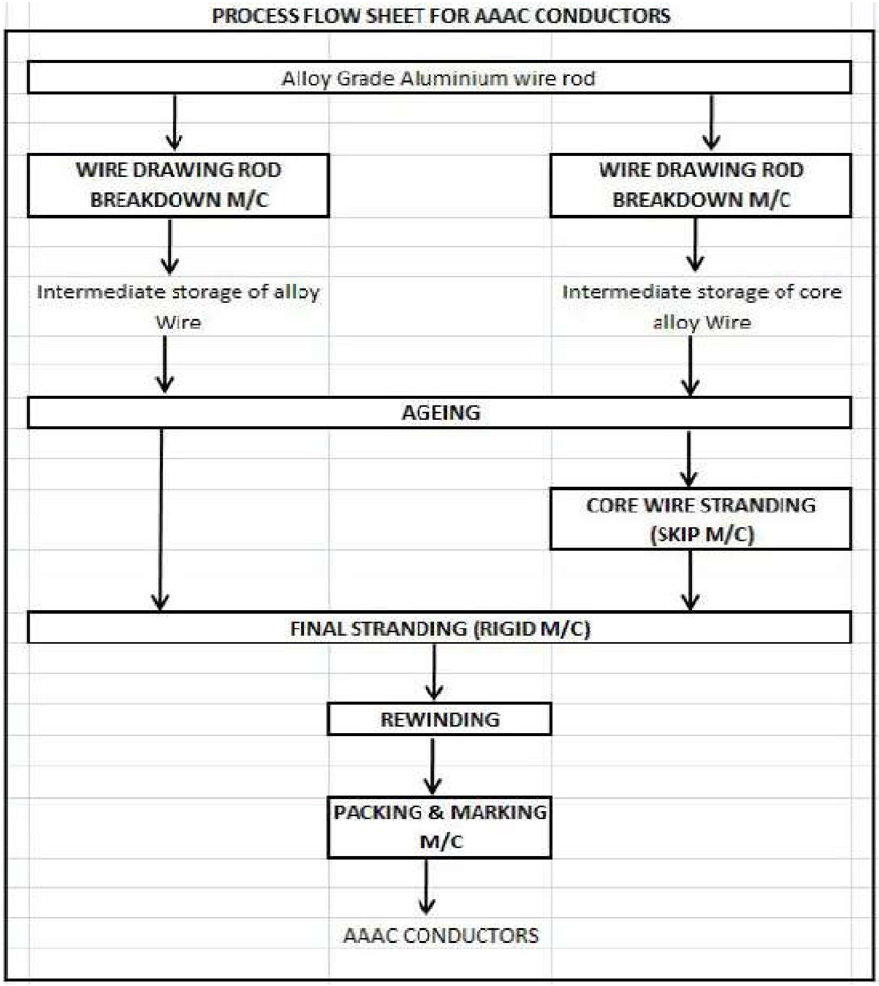
Name of Project	Facility for Manufacturing of Aluminium Circles
Area Requirement	4,900 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 3 – 4 Crore (at Angul)/ ~ INR 2 – 3 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 4 – 5 Crore
Project Scale	Capacity – 300 tpy
Process	The process comprises of melting of aluminium ingots and internal scrap including outside pure scrap in fuel fire melting cum holding furnace. The additive salts are charged for removal of impurities from metal as slag. The alloy preparation of clean metal is carried out by mixing master alloys as per requirement. This is followed by slab casting. Further, the hot rolling and cold rolling operations convert the slabs into cold rolled sheets. Further, annealing operation, which is a very critical stage to release stress developed during rolling stage, the temperature and time of exposure is very critical in this stage. This is followed by further rolling to required thickness. Thereafter, the circle cutting as per desired sizes is carried out. The annealed operation also provides an excellent deep drawing and spinning quality useful for further processing by others. The finished circles are packed for ready for dispatch to consumers who treat is as the main input raw material for further shaping into Pressure cookers, nonstickcookwares etc. For packing, the circle are covered with brown paper and plastic film then packed with wooden case/pallet.
Utilities	• Electricity (Connected Load) – 50 HP • Water 1 to 2 m3/day • Fuel Oil 80 kg/t metal
Manpower Requirement	21

8. Facility for Manufacturing of ACSR Grade Aluminium Conductors

Name of Project	Facility for Manufacturing of ACSR Grade Aluminium Conductors
Area Requirement	5 acre
Approx. Project cost	a) Land and Buildings : ~ INR 7 – 8 Crore (at Angul)/ : ~ INR 4– 6 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 8 – 10 Crore
Project Scale	Capacity – 5000 tpy
Process	The input material for ACSR conductor manufacturing is EC rods. The complete conductor manufacturing process has been shown in the process flow sheet below :  During the aluminium wire drawing, the multi-stage reduction of aluminium wire rod is carried out through passage of successive dies of decreasing die aperture by means of a tensile force applied at the exit side of each die. The aluminium wire are loaded in the skip stranding machine for aluminium core stranding. In another operation, the galvanized steel wires are coiled in spools and loaded in the tubular stranding machine for steel core wire requirement. The coiled drums are used in the final stranding for the ACSR conductors. The Aluminium wire so produced are stranded in numbers and laying configuration as per the conductor size and end applications. The stranding machines may be tubular type or bobbin pintle type or cage type stranding machine. The production of stranded conductors are based on a series of standards. Testing of the products is followed by the last step of the process, viz.

Name of Project	Facility for Manufacturing of ACSR Grade Aluminium Conductors
	packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants. In addition, the auxiliary facilities such as hydraulic systems, lubrication systems, etc. will be part of the individual machines.
Utilities	• Electricity (Connected Load) – 500 KVA • Water 2 m3/day • Compressed Air 2 to 5 Nm3/min
Manpower Requirement	20

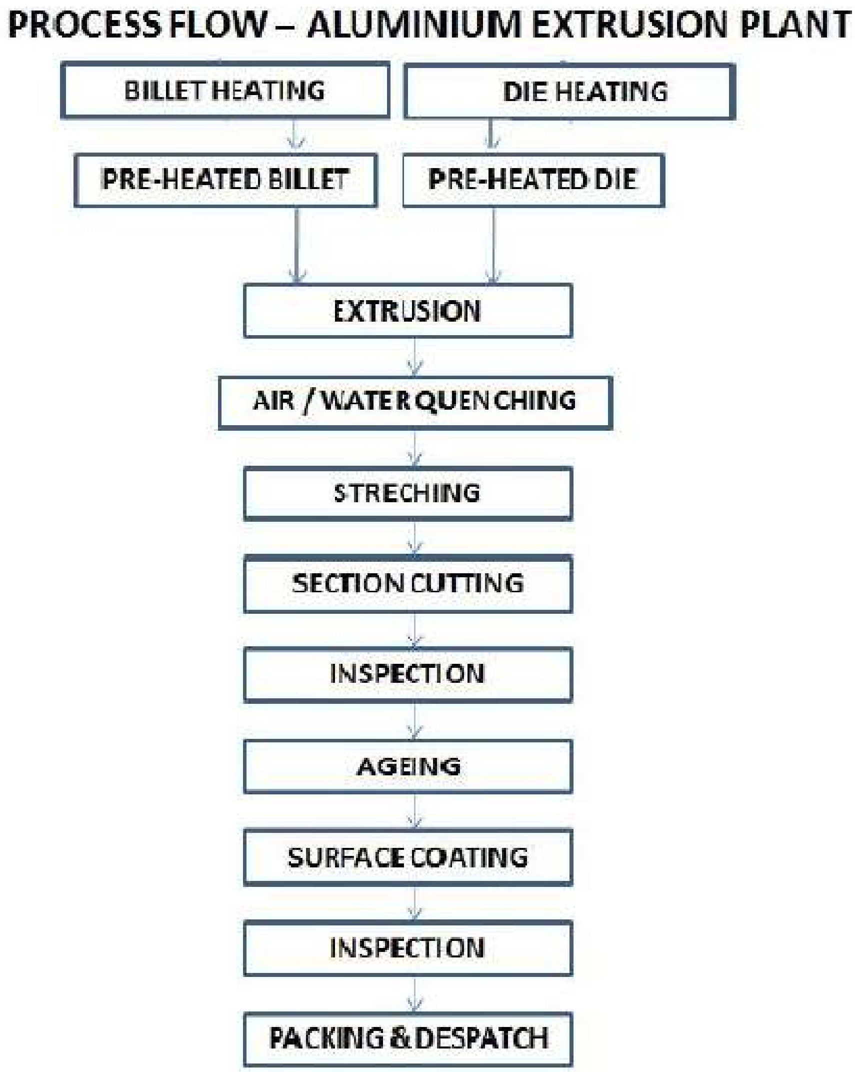
9. Facility for Manufacturing of AAAC Grade Aluminium Conductors

Name of Project	Facility for Manufacturing of AAAC Grade Aluminium Conductors
Area Requirement	5 acre
Approx. Project cost	a) Land and Buildings : ~ INR 7 – 8 Crore (at Angul)/ : ~ INR 4– 6 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 10 – 12 Crore
Project Scale	Capacity – 5000 tpy
Process	The input material for AAAC conductor manufacturing is Aluminium Alloy rods. The complete conductor manufacturing process has been shown in the process flow sheet below :  During the aluminium wire drawing, the multi-stage reduction of aluminium wire rod is carried out through passage of successive dies of decreasing die aperture by means of a tensile force applied at the exit side of each die. The aluminium wire are loaded in the skip stranding machine for aluminium core stranding. In another operation, the aluminium alloy wires are coiled in spools and loaded in the skip machine for alloy core wire requirement. The coiled drums are used in the final stranding for the AAAC conductors. The Aluminium wire so produced are stranded in numbers and laying configuration as per the conductor size and end applications after Ageing operation. The stranding machines may be tubular type or

Name of Project	**Facility for Manufacturing of AAAC Grade Aluminium Conductors**
	bobbin pintle type or cage type stranding machine. The production of stranded conductors are based on a series of standards. Testing of the products is followed by the last step of the process, viz. packaging, which ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants. In addition, the auxiliary facilities such as hydraulic systems, lubrication systems, etc. will be part of the individual machines.
Utilities	• Electricity (Connected Load) – 500 KVA • Water 2 m3/day • Compressed Air 2 to 5 Nm3/min
Manpower Requirement	20

10. Facility for Manufacturing of Aluminium Extrusion

Name of Project	**Facility for Manufacturing of Aluminium Extrusion**
Area Requirement	10,000 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 10 – 12 Crore (at Angul)/ : ~ INR 8 – 10 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 25 – 30 Crore
Project Scale	Capacity – 1000 tpy
Process	The two main advantages of extrusion process over other manufacturing processes are its ability to create very complex cross-sections and work materials that are brittle, because the material only encounters compressive and shear stresses. It also forms finished parts with an excellent surface finish. The extrusion ratio is defined as the starting cross-sectional area divided by the cross-sectional area of the final extrusion. One of the main advantages of the extrusion process is that this ratio can be very large while still producing quality parts. The process of aluminium extrusion consists of the following steps: After designing and creating the shape of the die, a cylindrical billet of aluminium alloy is heated to 400°C ~ 490°C. Subsequently the hot billet transferred to a loader, where a lubricant is added to prevent it from sticking to the extrusion machine, the ram or the handle. Substantial pressure is applied to a dummy block using a ram, which pushes the aluminium billet into the container, forcing it through the die. Inert atmosphere is created by introducing nitrogen in liquid or gaseous form through the sections of the die to avoid the formation of oxides. This also improves the life of the die. The extruded part passes onto a run-out table as an elongated piece that is having the same shape as the die opening. It is then pulled to the cooling table where fans cool the newly created aluminium extrusion. Once the cooling is completed, the extruded aluminium is moved to a stretcher, for straightening and work hardening. The hardened extrusions are brought to the saw table and cut according to the required lengths. The final step is to treat the extrusions with heat in age ovens, which hardens the aluminium by speeding the ageing process. This operation is performed in a temperature range of 170 ~ 190°C for a prolonged time of 4 ~ 7 hours, so as improve the strength of extrusions. The extrusion process can be performed in two ways, viz. (1) Direct extrusion, in which the moving ram forces the billet through a stationary die, and (2) Indirect extrusion, in which the die assembly pushes against the stationary billet creating the pressure for metal to flow through the die. Additional complexities may be applied during this process to further customize the extruded parts. For example, to create hollow sections, pins or piercing mandrels are placed inside the die. After the extrusion process, a variety of options are available to adjust the colour, texture and brightness of the aluminium's finish, which may be carried out by outsourcing. A brief process flow sheet of aluminium extrusion process is shown below



Utilities	• Electricity (Connected Load) – 150 Kw • Water 2 m3/day
Manpower Requirement	25

11. Facility for Manufacturing of Aluminium Forgings

Name of Project	**Facility for Manufacturing of Aluminium Forgings**
Area Requirement	2500 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 2 – 3 Crore (at Angul)/ : ~ INR 1 – 2 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 6 – 7 Crore
Project Scale	Capacity – 1000 tpy
Process	Blanks are cut from alloy billet stock, which are preheated to temperatures in the range of 400-500°C. In the production of hand forgings the blank is hot worked between flat dies, usually on a pneumatic hammer or a press. Care is taken to ensure that the degree of deformation is sufficient to provide adequate breakdown of the original cast microstructure. The rough outline of the component is developed, with the grain flow of the material in the direction of stressing. Ideal for processing large pieces of aluminium, the open die presses do not constrain the aluminium billet during the forging process and utilize flat dies free of pre-cut profiles and designs. On the other hand, the closed-die forging, also known as impression-die forging, can produce an almost limitless variety of shapes. Die-forgings, i.e. pressing and drop-forgings or stampings, are usually subjected to open die forgings. Simple components may be pressed or stamped directly from billet stock. The die forgings are produced using shaped dies, giving a product with a high degree of dimensional consistency which considerably reduces the machining to the finished form. Such forgings have the advantages of good mechanical properties and structural integrity. The technology of die forming has advanced to produce close-to-form forgings with higher standards of dimensional accuracy. In the non heat treatable alloys where mechanical properties depend on the degree of cold working it is possible to cold forge.To produce components like gears, hubs, shafts, pinions, couplings, links, valves, drop arms, joints, sleeves, special fasteners, square head bolts, etc., the closed die forgings is adopted by press, hammers &upsetter combination followed by machining operations in CNC & VMC & broaching machines. A combination of good mechanical properties, dimensional accuracy and surface finish means that aluminium forgings are used in highly stressed parts where structural integrity is of paramount importance. The alloys commonly used for these highly stressed applications are from the 2000, 6000 and 7000 series. The aerospace industry is a major end user.
Utilities	• Electricity (Connected Load) – 1 mw • Water 3 to 4 m3/day
Manpower Requirement	60 to 65

12. Facility for Manufacturing of Aluminium Hinges

Name of Project	Facility for Manufacturing of Aluminium Hinges
Area Requirement	625 sq m
Approx. Project cost	a) Land and Buildings : ~ INR ~ 40 Lakh (at Angul)/ : ~ INR ~ 25 – 30 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 20 – 22 Lakh
Project Scale	5 lac pieces per year
Process	The aluminium hinges manufacturing process requires the cutting of extruded sections into required dimension. Subsequently the slots are milled matching with tapers pins to be used for their fixing. This is followed by drilling holes for hinges. Subsequently the already cut steel wires of requited length are riveted by stabbing both top and bottom faces of finge. This is followed by finish cutting, de-burring, buffing as well as stamp markings. The further requirement of anodizing can be outsourced from nearby available agencies. Finally the product is packed for dispatch to the finished storage area / market. The packaging ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants.
Utilities	• Electricity (Connected Load) – 10 to 12 HP
Manpower Requirement	8 to 10

13. Facility for Manufacturing of Aluminium Utensils

Name of Project	Facility for Manufacturing of Aluminium Utensils
Area Requirement	6400 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 2 ~ 3 Crore (at Angul)/ : ~ INR 1 ~ 2 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 6 – 8 Crore
Project Scale	600 tpy
Process	The process comprises of melting of aluminium ingots and scrap in Electric furnace followed by slab casting. Further, the hot rolling process converts preheated slabs into first stage for flat sheets of thickness 80 mm to 50 mm. It is essentially a step towards sheet making. It is followed by cold rolling The cold rolled process rolls and reduces from thickness from 45-50 mm to 30-25 mm, as required to make utensils. The rough edges of cold rolled sheets are cut before going to round cut to make circles. Further, annealing is a very critical stage to release stress developed during rolling stage, the temperature and time of exposure is very critical in this stage. In another operation, the handles are also cast from molten metal and kept in storage. Most important stage that gives shape to sheet into the desired utensils is during press forming. It is done through heavy press forming machines, hydraulic, bought over from steel industries. The quality of product depends on this stage equally, so most skilled labour work on the machinery to regulate quality. The most critical component for this stage is different size die. Single die works for years as aluminium is comparatively softer material. The spinning operation too is critical in shaping majority of utensils such as balti, tub etc , and is a skill oriented job. The hand tools plays critical role here, since they shape the outer surface and a bad tool can leave mark, uneven surface. The quality of product depends on this stage equally, so most skilled labour work on the machinery to regulate quality. This operation is followed by Post forming operation to remove uneven edges, for which, it again goes onto turning wheel and the extra edge cut to size. The buffing operation removes outer and inner layer, which is generally carried out by semi skilled labour. Washing is the last stage of cleaning surface and shining material. For this, the utensil goes through 3 stages of dipping into water and chemicals. It removes all minor particles and provides natural shining. Subsequently, handles are riveted post finishing the product, it causes scratches some time due to hammering and hard surface. The labelling is an important stage of branding utensils, for which stickers are used merely for name the brand. The packaging for local market is always basic to reduce cost where as export quality packaging demands lot more attentions and investment.
Utilities	• Electricity (Connected Load) – 100 kw • Water 1 to 2 m3/day
Manpower Requirement	27

14. Facility for Aluminium Recycling Plant

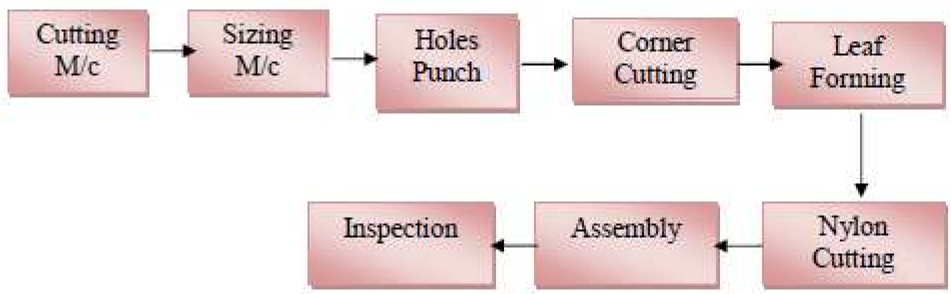
Name of Project	Facility for Aluminium Recycling Plant
Area Requirement	10000 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 4 ~ 6 Crore (at Angul)/ : ~ INR 2 ~ 3 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 12 – 15 Crore
Project Scale	600 tpy
Process	The aluminium casting process involves simply re-melting the aluminium scrap metal. The process is generally termed as aluminium recycling. The attractive feature of aluminium metal is that it can be reused/recycled. As recycling does not damage the metal structure, aluminium can be recycled indefinitely and still be used to produce any product for which new aluminium could have been used. Suitable alloying additions are made as per the customer requirement to produce required aluminium alloy grades. Aluminium scrap are usually recycled in the following basic way: 1. Physical classification of aluminium scrap, usually manually as well as magnetic separator/ eddy current separator, and cut into little, equal pieces by crushers to lessen the volume and make it easier for the machines that separate them. 2. Pieces are cleaned chemically/mechanically, and blocked to minimize oxidation losses when melted. (The surface of aluminium readily oxidizes back into aluminium oxide when exposed to oxygen.. 3. Blocks are loaded into the furnace and heated to 750 °C ± 100 °C to produce molten aluminium. 4. Dross is removed and the dissolved hydrogen is degassed. The molten aluminium readily disassociates hydrogen from water vapor and hydrocarbon contaminants. This is typically done with chlorine and nitrogen gas. Hexachloroethane tablets are normally used as the source for chlorine. Ammonium perchlorate can also be used, as it decomposes mainly into chlorine, nitrogen, and oxygen when heated. 5. Samples are taken for spectroscopic analysis. Depending on the final product desired, high purity aluminium, copper, zinc, manganese, silicon, and/or magnesium is added to alter the molten composition to the proper alloy specification. 6. The furnace is tapped, the molten aluminium poured out, and the process is repeated again for the next batch. The molten metal is transferred through launders into continuous Ingot casting machine to produce commercial / alloy ingots.
Utilities	• Electricity (Connected Load) – 500 to 800 kw • Water 1 to 2 m3/day • Fuel Oil 80 kg/t Al
Manpower Requirement	30

15. Facility for Manufacturing of Aluminium Tower Bolts

Name of Project	Facility for Manufacturing of Aluminium Tower Bolts

Area Requirement	900 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 35 ~ 40 Lakh (at Angul)/ : ~ INR 20 ~ 25 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 20 – 22 Lakh
Project Scale	5 lac pieces per year
Process	The aluminium tower bolts manufacturing process requires the cutting of extruded sections into required dimension. This is followed by straddle milling of slots for axial movement of knob. For up and down movement of rod, milling of cross slots is carried out. Subsequently the drilling of countersink holes and cavity holes are taken up. The rods are fitted inside extruded sections which is followed by riveting the knob on rod and stab operations. Thereafter, finish cutting, de-burring, buffing as well as stamp markings operations are carried out. The further requirement of anodizing can be outsourced from nearby available agencies. Finally the product is packed for dispatch to the finished storage area / market. The packaging ensures product safety from any outer mechanical damage as well as protection from moisture and contaminants.
Utilities	• Electricity (Connected Load) – 10 to 15 HP
Manpower Requirement	10 to 12

16. Facility for Manufacturing of Vanatian Blinds

Name of Project	Facility for Manufacturing of Vanatian Blinds
Area Requirement	600 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 25 ~ 30 Lakh (at Angul)/ : ~ INR 15 ~ 18 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 20 – 22 Lakh
Project Scale	210,000 sq m
Process	The process comprises of cussing and sizing of the aluminium sheet to required size followed by punching of holes as per design. It is followed by corner corrections and leaf forming operations. In another operation, the nylon rope cutting and assembly of Vanatian blind is carried out 
Utilities	• Electricity (Connected Load) – 15 kw • Water Nominal requirement
Manpower Requirement	9

17. Facility for Anodising Plant

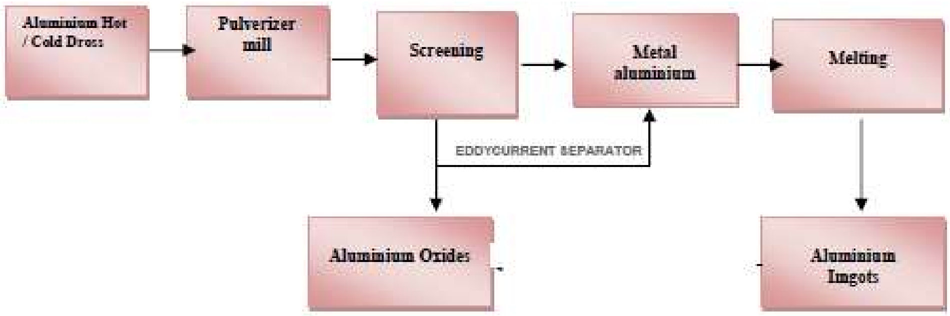
Name of Project	Facility for Anodising Plant
Area Requirement	1600 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 60 ~ 65 Lakh (at Angul)/ : ~ INR 35 ~ 50 Lakh (at Jharsuguda) b) Plant and Equipment : ~ INR 40 – 45 Lakh
Project Scale	60,000 sq m
Process	Anodising process involves buffing, pickling, in acid solution then cleaning in water, neutralizing in chemical and keeping the extruded sections in anodizing tank for specified time. These are again washed in water and dried in sun or by any other means. The anodizing process using acid solution may leave residual solution which has to be disposed of periodically. This may lead to some pollution in the water source if the disposal of such residual solution is not done taking due precautions. The anodized aluminium layer is grown by passing a direct current through an electrolytic solution, with the aluminium object serving as the anode (the positive electrode). The current releases hydrogen at the cathode (the negative electrode) and oxygen at the surface of the aluminium anode, creating a buildup of aluminium oxide. Alternating current and pulsed current is also possible but rarely used. The voltage required by various solutions may range from 1 to 300 V DC, although most fall in the range of 15 to 21 V. Higher voltages are typically required for thicker coatings formed in sulfuric and organic acid. The anodizing current varies with the area of aluminium being anodized, and typically ranges from 30 to 300 amperes/meter^2 (2.8 to 28 ampere/ft^2). Aluminium anodizing is usually performed in an acid solution which slowly dissolves the aluminium oxide. The acid action is balanced with the oxidation rate to form a coating with nanopores, 10-150 nm in diameter. These pores are what allow the electrolyte solution and current to reach the aluminium substrate and continue growing the coating to greater thickness beyond what is produced by autopassivation. However, these same pores will later permit air or water to reach the substrate and initiate corrosion if not sealed. They are often filled with colored dyes and/or corrosion inhibitors before sealing. Because the dye is only superficial, the underlying oxide may continue to provide corrosion protection even if minor wear and scratches may break through the dyed layer. Conditions such as electrolyte concentration, acidity, solution temperature, and current must be controlled to allow the formation of a consistent oxide layer. Harder, thicker films tend to be produced by more dilute solutions at lower temperatures with higher voltages and currents. The film thickness can range from under 0.5 micrometers for bright decorative work up to 150 micrometers for architectural applications. Anodizing can be performed in combination with chromate conversion coating. Each process provides corrosion resistance, with anodizing offering a significant advantage when it comes to ruggedness or physical wear resistance. The reason for combining the processes

Name of Project	**Facility for Anodising Plant**
	can vary, however the significant difference between anodizing and chromate conversion coating is the electrical conductivity of the films produced. Although both stable compounds, chromate conversion coating has a greatly increased electrical conductivity. Applications where this may be useful are varied, however the issue of grounding or earthing components as part of a larger system is an obvious one. The dual finishing process uses the best each process has to offer, anodizing with its hard wear resistance and chromate conversion coating with its electrical conductivity. The process steps can typically involve chromate conversion coating the entire component, followed by a masking of the surface in areas where the chromate coating must remain intact. Beyond that, the chromate coating is then dissolved in unmasked areas. The component can then be anodized, with anodizing taking to the unmasked areas. The exact process will vary dependent on service provider, component geometry and required outcome. Other widely used specifications define three types of aluminium anodization : Type I is chromic acid anodization, Type II is sulfuric acid anodization, and Type III is sulfuric acid hardcoat anodization. The oldest anodizing process uses chromic acid. The sSulfuric acid is the most widely used solution to produce anodized coating. Coatings of moderate thickness 1.8 μm to 25 μm (0.00007" to 0.001").
Utilities	• Electricity (Connected Load) – 120 HP • Water 5 to 6 m3/day
Manpower Requirement	18

18. Setting up of Centralised Metal Testing Laboratory

Name of Project	**Setting up of Centralised Metal Testing Laboratory**
Area Requirement	900 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 2.0 ~ 2.5 Crore (at Angul)/ : ~ INR 1.5 ~ 2.0 Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 7.0 ~ 8.0 Crore
Project Scale	210,000 sq m
Process	A systematic approach shall be followed for collection of samples from individual industries as well as timely delivery of test reports to respective units. The major steps shall include, viz. exact information regarding details of sample collected, use of proper sampling containers, chemicals for sample preservation, collect samples according to standard procedures, delivery of samples to the laboratory supervisor and ensure acceptance, log samples into the laboratory's sample data management system, report generation, and timely delivery of test report to the respective units for its effective ulilisation, etc..
Utilities	• Electricity (Connected Load) – 20 kw • Water 1 to 2 m3/day
Manpower Requirement	10

19. Facility for Manufacturing Aluminium Dross Processing

Name of Project	**Facility for Manufacturing Aluminium Dross Processing**
Area Requirement	2500 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 85 ~ 90 Lakh (at Angul)/ : ~ INR 45 ~ 50 Lakh Crore (at Jharsuguda) b) Plant and Equipment : ~ INR 65 ~ 80 Lakh
Project Scale	1500 tpy of dross processing
Process	There are many methods and technologies available for the processing of dross. The key criteria of selection should take into account the local environmental laws, smelter's vision and industrial infrastructure. It is proposed to carry out the cold dross processing by passing it to the pulverize mill followed by screening operation. The crushed dross is then passed to eddy current separation of metal and aluminium oxides. A proper shop ventilation system is essential to keep the working environment under proper control. The separated aluminium is sent to melting furnace where low grade dross is again separated and molten metal is cast into ingots. The non metallic oxide collected in powder form is stored in bags for selling to other consumers. 
Utilities	• Electricity (Connected Load) – 10 HP • Water 1 to 2 m3/day • Fuel 80kg/t metal
Manpower Requirement	15

20. Facility for Expanded Metal Mesh Manufacturing

Name of Project	**Facility for Expanded Metal Mesh Manufacturing**
Area Requirement	1000 sq m
Approx. Project cost	a) Land and Buildings : ~ INR 80 – 100 Lakhs (at Angul)/ ~ INR 35 - 40 Lakhs (at Jharsuguda) b) Plant and Equipment : ~ INR 35 – 45 Lakhs
Project Scale	30 tonnes per day
Process	1. The plate, sheet, or coil is mechanically advanced beyond the fixed bottom die in an amount that is known as the strand width in regular (standard) expanded metal. The top cutting die then descends and simultaneously slits and cold forms an entire row of half diamonds. 2. The top die then ascends and moves one half diamond right/left as the base metal moves forward one strand width. 3. The top die then decends, slits and forms another row of half diamonds, completing a row of full diamonds in two strokes. 4. The die then ascends, returning to its normal position and begins the process again until the full sheet of expanded metal is completed.
Utilities	• Electricity (Connected Load) – 200 kw • Water 1 to 2 m3/day
Manpower Requirement	8

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