

CLUSTER PROFILE

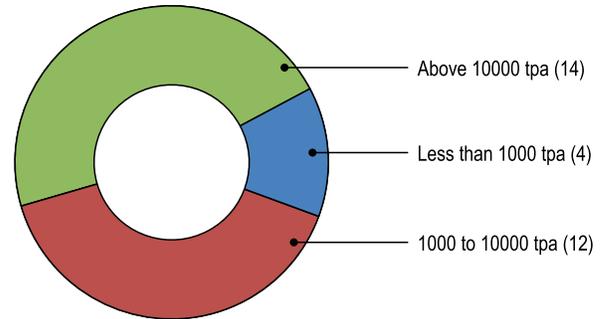
KOCHI SEAFOOD PROCESSING CLUSTER

Background

The seafood processing industry is a substantial contributor to India's exports earnings. According to the Marine Products Export Development Authority (MPEDA), a statutory body under the Ministry of Commerce and Industry, in the financial year 2013–14 India exported 0.98 million tonnes of marine products (primarily, seafood) valued at USD 5007 million (Rs 30213 crores). The principal markets for these products, in terms of USD values realized, were: South East Asia (26.38%); USA (25.68%); EU (20.24%); Japan (8.21%); China (5.85%) and the Middle East (5.45%). MPEDA envisages an exports target of USD 6 billion in 2014–15 for marine products

The state of Kerala has the largest number of seafood processing units in the country (about 80). An important cluster of seafood processing units is located around the port city of Kochi. The units are spread along the National Highway between Thoppumpady in Ernakulam District and Aroor in Alappuzha District. Kochi pioneered seafood exports from India in 1953, taking advantage of good catch throughout the year, availability of skilled labour, and access to Kochi port. Initially, units in the Kochi cluster focused on exporting canned shrimp. While shrimp continues to be the major product, accounting for about 45% of total earnings, the Kochi units have since diversified into processing other kinds of fish and cephalopods like squid, cuttlefish, octopus, crab, clams, mussels, etc.

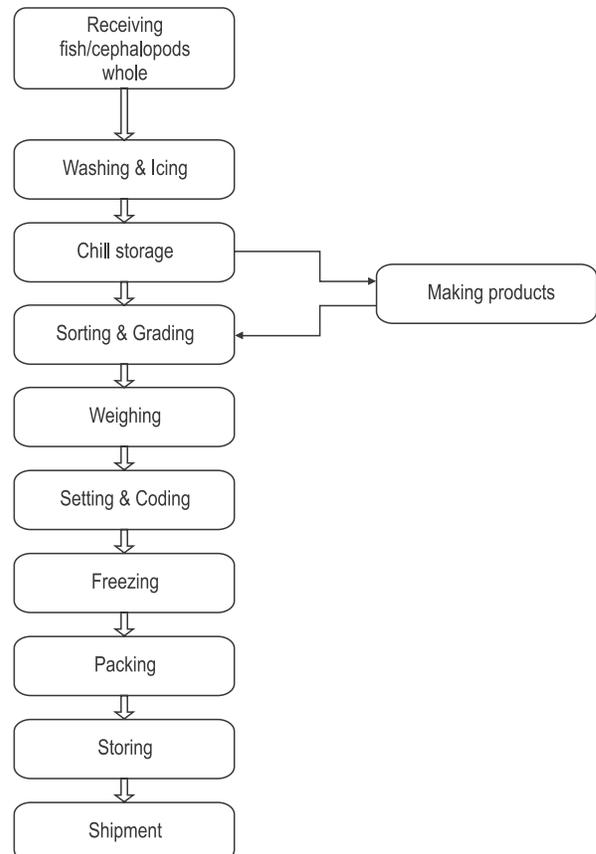
There are around 35 seafood processing units in the Kochi cluster, of which 30 units were selected for study under the BEE SME Program. All 30 units are registered as small-scale industries with the Government of Kerala, and are members of the Seafood Exporters Association of India (SEAI). Many of the units also have entrepreneurship memorandum numbers issued by the Department of MSME. The production capacities of the units range from 456 tonnes per annum (tpa) to 46500 tpa. Their daily operating capacities vary depending on the season and the nature and availability of fish being processed.



Categorization of Kochi seafood processing units by production capacity

Technology status and energy use

Seafood products are highly perishable. Hence, proper handling and preservation techniques are needed to ensure that the products have a long shelf life and retain the desired quality and nutritional value. The chart shows the process typically followed in a seafood processing unit. In all the 30 units surveyed, the pre-processing and



Process flow chart

Table 1. Types of freezers used by seafood processing units

No.	Type of freezer	Main features
1	Individual quick freezer	<ul style="list-style-type: none"> Each product individually frozen in the chamber Reduced cycle time compared to conventional freezers Air temperature around -40°C High air speed over the product to enhance heat transfer
2	Blast freezer	<ul style="list-style-type: none"> Blower forces chilled air over products for rapid cooling Movable trays for positioning products; assortment of freezing compartments Air temperature around -40°C High air speed over the product to enhance heat transfer
3	Plate freezer	<ul style="list-style-type: none"> Stack of horizontal metal plates placed inside adjustable steel frame; the plates are cooled to sub-freezing temperatures by internally circulating refrigerants Packaged products are firmly pressed between the plates High rates of heat transfer obtained between product and plates Plate freezers are used to freeze flat products and brick-shaped packages..

cleaning of the feedstock is carried out outside the units and the operations within the unit start with the freezing of the pre-processed/cleaned feedstock.

Freezing is a key element of seafood processing, as low temperatures kill or slow down the growth of pathogens that would otherwise spoil the seafood. The freezer extracts heat from the seafood product, thereby lowering its temperature and converting its free moisture into ice. The freezing process has to be carried out sufficiently fast so that the degradation of the product is minimized; the rate of freezing keeps pace with the production schedule; and upon exit from the freezer, the average product temperature roughly matches the subsequent storage temperature. Seafood products may be preserved for several months by freezing. Table 1 summarizes the three main kinds of freezers used by the units. Other equipment used by the units include different kinds of compressors, condensers, cooling towers, ice making units, and the motors connected to these various systems.

Energy consumption pattern

Electricity is the primary source of energy for all the Kochi seafood processing units. The freezing process accounts



Seafood processing unit

for nearly 75% of the total electricity consumption in the cluster. The freezers used by the units are typically built on-site by local fabricators. They are generally operated without any automation or feedback control, which reduces energy efficiency. Because of the fear of rejection of products that do not meet core temperature specifications, most units deliberately over-freeze their products; this again translates to excessive energy consumption.

The total annual electricity consumption in the cluster is about 30000 MWh, or 2574 tonnes of oil equivalent (toe). The specific energy consumption ranges from 0.032 toe/t to 0.072 toe/t.

Options for energy saving

Table 2 summarizes a number of energy conservation measures (ECMs) that could be adopted by the units in the Kochi cluster. As most of the units follow similar processes, there is good scope for replication of these ECMs if they are initially taken up in one or two units.



Refrigeration system

Table 2. Key energy conservation options in Kochi seafood processing cluster

No.	Existing process / technology	ECM	Energy saving potential
1	Ice making process	Install thermal storage system for ice making process	High
2	Compressor	Replace reciprocating compressor with screw compressor	High
3	Centrifugal pumps	Use of VFD for centrifugal pumps	Medium
4	Condenser/ heat exchanger	Replace shell & tube condensers/ plate heat exchangers and cooling towers with evaporative condensers	Medium
5	Refrigeration system	Replace vapour compression refrigeration with vapour absorption machine (VAM) operated with LNG or biomass fuels	High
6	Compressor motor	Replacement of V-belt drive with flat belts	Low
7	Insulation	Maintenance and replacement of damaged insulation	Medium
8	Thermocol insulated door	Replace with PUF insulation	Low
9	Lighting feeder	Install servo stabilizer	Low
10	Under- loaded motors	Install automatic star delta star starter	Low

Compiled by TERI from (i) 'Manual on energy conservation opportunities in seafood processing industries, Kochi' under the BEE-SME Programme, 2010; (ii) 'Benchmarking and mapping Indian MSMEs energy consumption': a BEE-AfD-TERI study, 2012