# Importance of Cold Chain to the Fish Industry

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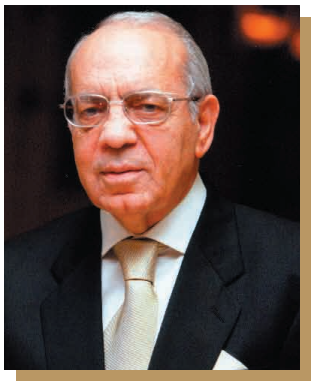
## 1. Short description of Arab Fisheries sector



A cold chain is one of the most critical requirements to guarantee the quality of the fresh, chilled, frozen or processed fishery products. Preservation quality and safety of fish and fishery products from the fishing boat or farm to the points of retail, wholesale or to the processing plant and until it reaches the consumer is a priority. In several Arab countries there are a number of obvious breaks and weaknesses in the present cold chain for fish products especially in the artisanal fisheries sector where fishing activities are carried out in remote rural areas where the infrastructure facilities are poor or non-existent.

In the artisanal and small-scale fisheries sector which produces between 85% - 90% of total fish landings of the region, there is a shortage of awareness of and appreciation for cold chain systems at several levels of the industry especially in the more remote and rural areas where artisanal fishermen operate. Most of these fishermen are not aware of the beneficial impact of getting their fish catches into a cold chain system. Coastal markets lack the awareness to utilize cold storage to improve catches quality shelf life, and the basic belief that fish will be consumed within a few hours limits the creative thinking and desire to integrate catches into cold chain systems as soon as the fish is landed.

In full contrast to the artisanal small-scale sector, the semi-industrial and industrial fisheries sector has developed over the years into various degrees of sophistication by installing and operating the latest in equipment and technologies in cold chain systems. These insured preservation and good quality of their fish catches, processing, distribution and marketing, as well as importing and exporting fish and fishery products regionally and inter-regionally. In several countries in the region, many successful fisheries enterprises were established over the last three to four decades several of them operating fishing vessels and trawlers of medium to large vessels and mother ships that make fishing trips of one week to a month or more.

Table 1 shows the latest FAO fisheries statistics for the years 2007 - 2010 which indicate that total landings from all fisheries sources available to the Arab countries show a fluctuating downward trend in capture fisheries landings but a steady rising trend in aquaculture landings. However, due to the fast expansion in aquaculture in most several Arab countries, especially in Egypt and Saudi Arabia, an efficient cold chain becomes the more urgent need as compared to the declining trend in capture fisheries especially in the short and medium run in major fish farming areas. The sector has all the natural advantages of inland waters in rivers lakes as well as coastal marine areas where mariculture may be practiced. In anticipation of this growth, a reliable cold chain set-up is required to cater for the increase in production with facilities for icing, chilling, refrigeration and freezing catches as well as a reliable transportation system of products for distribution to marketing outlets or for export.

## 2. An efficient cold chain for fish preservation is essential

Fish preservation and processing may vary according to species. Each of the many thousands of fish species has its own characteristic composition, size, shape and intrinsic chemistry. Fish is very perishable and several chemical and biological changes take place immediately after capture and/or harvest. Fish requires careful handling and preservation, special facilities such as cold storage, refrigerated transport and rapid delivery to consumers. Therefore, the research and development of post-harvest systems for handling raw material are important to developing appropriate measures to: (i) increase its shelf- life; (ii) reduce physical, organoleptic (sensory) and nutritional losses; and (iii) preserve the quality and safety of the finished products. This is important for ecological, social


**Table 1: Total Capture and Aquaculture Fish Production in Arab Countries: 2007-2010 (Tonnes)**

| Fisheries | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| Capture | 2,696,034 | 2,702,444 | 2,852,603 | 2,637,376 |
| Aquaculture | 845,917 | 911,301 | 950,392F | 987,712 |
| **Total** | **3,541,951** | **3,613,745** | **3,802,995** | **3,625,088** |

and economic reasons – to safeguard consumer health and food security and to ensure the sustainability of the industry.

Seafood consumers around the world increased consumption of fish and fishery products in recent years due to recognition of their nutritional value. But as one kind of perishable and short shelf-life goods, fishes are easy to deteriorate and the process is accelerated with increasing temperature owing to a number of factors such as microbial metabolism, oxidative reaction and enzymatic activity. Consequently, fish economic value and use value is seriously affected. The cold chain management has become crucial, challenging and important to keep fish product safety due to a high number of product variants, strict traceability requirements from the customer and the need for temperature control in the supply chain.

Throughout the journey from catch to consumer, the fishing industry relies on a cold chain to ensure the commercial viability of many of these products. The safety of the food, its shelf life, taste and appearance all depend on reliable refrigeration to retard spoilage. This cold chain may take various forms including ice, refrigerated seawater, refrigerated compartments and cold stores, but a common feature in all of these applications has been the traditional use of CFC-based refrigeration technology.

Careful handling, clean hygienic practices and low temperature conditions during processing, storage and transportation can be highly effective in retarding the spoilage of fish. Clean hygienic practices, involving careful processing, washing with clean water and handling of fish, are vital.

To ensure good quality, the fish catch should be cleaned and chilled to 0 °C and frozen, as quickly as possible. Chilling and freezing operations do not improve the fish quality, but slow down the bacterial, enzymatic and chemical actions thus prolonging the shelf life of the fish.

With limited and diminishing conventional wild fish resources, aquaculture has tremendous potential for growth, especially in the temperate climate of many Arab countries, as it involves considerably less stringent refrigeration. Development of aquaculture ponds and farms nearer to the consumption area do not need large freezing, cold storage and refrigerated transport facilities. This provides for a better quality live fish for the consumer

**Table 3: Recommended Storage Requirements for Some Fish Species**

| Fish Species | Storage Temperature (°C) | Relative Humidity | Appropriate storage life |
|---|---|---|---|
| Most Demersal species (Breams, Grouper, etc.) | -1 to 1 | 95 to 100 | 12 days |
| Most Pelagic species (Sardine, Mackerel, etc.) | 0 to 1 | 95 to 100 | 6 to 8 days |
| Tuna | 0 to 2 | 95 to 100 | 14 days |
| Shrimp | -1 to 1 | 95 to 100 | 12 to 14 days |
| Frozen Fish | -28 to -20 | 90 to 95 | 6 to 12 months |

and lower costs for the producer. This has also led to the development of fish sperm refrigeration and live fish transport technology involving lower refrigeration requirements. Under the hot and dry climate conditions evaporative cooling technology may be an effective and economic means of maintaining required temperature conditions in aquaculture ponds and during transport to retail outlet. As live fish are far better priced products than frozen fish, more and more efforts are being made to develop aquaculture of food fish and live fish transport. Such developments will have a significant effect on the fishery refrigeration industry.

The fishing industry must ensure that fish handling; processing and transportation facilities meet requisite standards. Adequate training of both industry and control authority staff must be provided by support institutions, and channels for feedback from consumers established. Ensuring high standards for quality and safety is good economics, minimizing losses that result from spoilage, damage to trade and from illness among consumers.

### 3. Recommendations to meet cold chain challenges in fisheries

In order to meet the challenges to reduce as much as possible the negative effects of the constrains in developing a good and sound fish and fishery products in the Arab region especially in the artisanal, small-scale fisheries sector, various steps needs to be taken that suites the standing situation in each of the countries of the region.

As a main recommendation, the establishment of an integrated cold chain linked to a supply chain or value chain that transfers perishable foods from the point of harvest to the final point of consumption is urgently required. Figure 1 suggests a model for an integrated cold chain which may be adjusted according to the standing situation where such a chain is to be established.

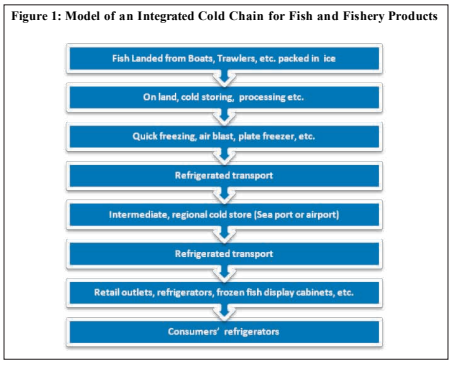



**Figure 1:** Model of an Integrated Cold Chain for Fish and Fishery Products Nevertheless, the primary links of an efficient and practical integrated cold chain in the fisheries based communities include the following essential five elements:

**i. Post harvest handling:** Post harvest handling involves the procedures or techniques that happen immediately after harvest on-board or on – land.

**ii. Processing and packaging:** Processing and packaging of fish and fish products are means to add value to products, while using the handling process to sort, size, grade and select species for consistency and quality.

**iii. Cold storage and distribution:** Cold storage and distribution services represent the next basic link in the integrated cold chain process.

**iv. Refrigerated transportation:** Refrigerated transportation is often overlooked when evaluating the overall efficiency of the integrated cold chain. Once fish and fishery products are placed under refrigeration, it is imperative that they remain refrigerated until consumption in order to preserve the inherent quality and validate the investment in processing, packaging and storage.

**v. Marketing of fish and fishery products:** Sales to the end user, including retail, wholesale, institutional or food service and trade represent the ultimate goal of cold chain systems.

## News IN BRIEF

### IDF partners with FAO

IDF joins forces with FAO for a new partnership, which aims at improving how the environmental impacts of the livestock industry are measured and assessed. This FAO-led partnership is a necessary first step in improving the sustainability of this important food production sector. FAO and governmental, private-sector, and non-governmental partners will work together on a number of fronts to strengthen the science of environmental benchmarking of livestock supply chains.

### SR516 million water, sewage projects in Saudi Arabia

Minister of Water and Electricity Abdullah Al-Husseyn signed a series of contracts on several water and sewage projects in various parts of the Saudi Arabia worth more than SR516 million.

### $3 million project for food security and nutrition of women and young people in Egypt

A new $3 million project that aims to improve food security and nutrition of women and young people in Egypt was announced by FAO. The project is being financed by the government of Italy. The project aims to improve food and nutrition security through higher food production, nutrition education for women and young people and capacity building to strengthen national and decentralized institutions.

### UN strengthens regulations

The UN food standards body has agreed on new regulations including the maximum level of melamine in liquid milk formula for babies to protect the health of consumers across the world. Other measures adopted include new food safety standards on seafood, melons, dried figs and food labelling. The Codex Alimentarius Commission, jointly run by the UN Food and Agriculture Organization (FAO) and the World Health Organization (WHO), sets international food safety and quality standards to promote safer and more nutritious food for consumers worldwide.

### Saudi government's investment in 2012 has reached $16 billion

The Saudi government's investment in the agriculture sector in 2012 has reached $16 billion.The government seeks to increase its investments in wheat storage facilities. Investment may reach an estimated value of $2.2 billion this year.