

Fish silage

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Utilisation of fish offal for animal feed

Senior consultant Mr Johnny Haupt Larsen from the Danish consulting company LarEll Associated Consultants has since 1991 worked with implementation of environmental friendly technologies and processes within the fish and seafood industry all over the world, but mainly in Scandinavia and Eastern Europe.

LarEll Associated Consultants was founded in 2000 by the International Fisheries Consultant Mr Johnny Haupt Larsen and the International Business Advisor Mr Jens Ellegaard who both are specialists with more than 20 years experience in assisting the fishing industry. Professor Piotr Bykowski with more than 40 years experience within fish processing joined the company as partner from January 2004.

LarEll offers, besides projects for improving of the environment, comprehensive consulting services covering the areas: sector planning, feasibility studies, layouts, design of processes and processing equipment, technology for exploitation of



Photo 1. Daily storage tank and part of silage plant in Poland installed in 2002

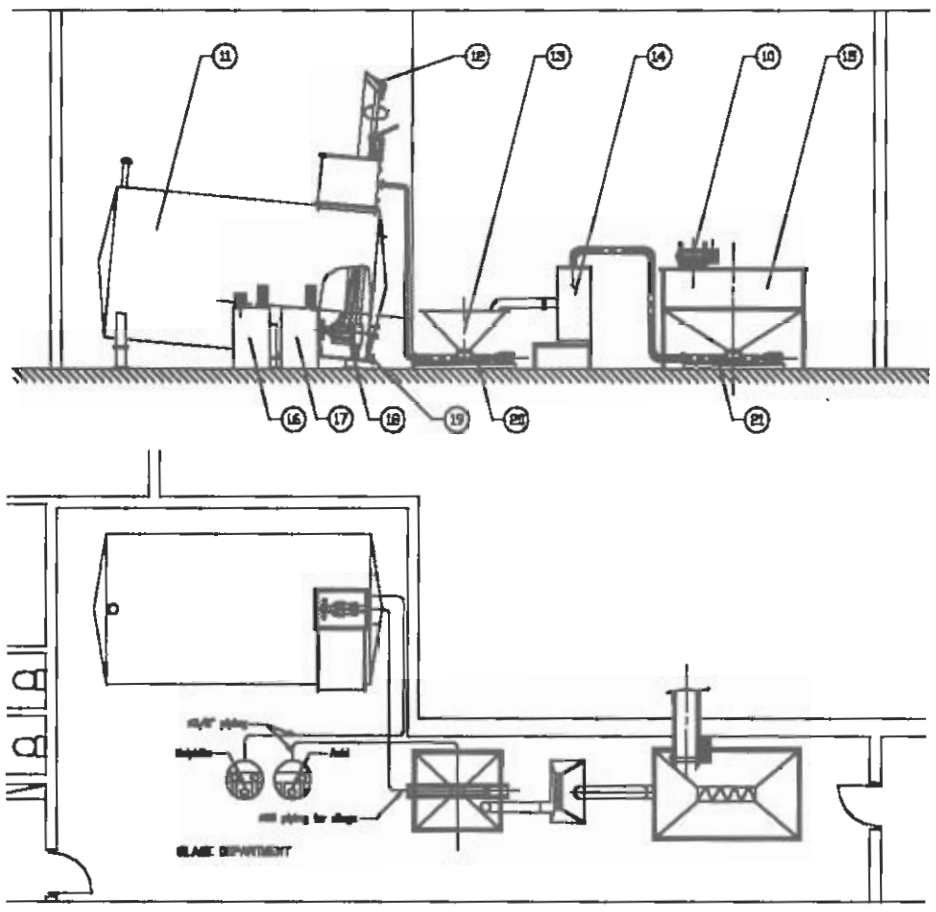
mental friendly nor economical. The fisheries industry as well as animal producers has over the last years shown interest in adding value to the offal to use it as higher quality animal food. The two possibilities to do so are fishmeal production or production of silage. The authorities and the fisheries industry are normally very reluctant to produce fishmeal as it has strong negative effects on the environment as stick water, air pollution, smell and large energy consumption. Furthermore is the investment in a fish meal plant very large.

new species, construction and installation of machinery, starting-up production, staff training programmes for managers and operators, rationalisation and economy and quality control systems, international sales and marketing of consumer goods all and exclusively related to the fishery sector.

One of the environmental friendly technologies, which have been implemented in some Polish, Latvian and recently an Estonian fish processing plant is the production of fish silage, made from processing waste of good quality, downgraded and too small fish – as a low cost alternative to fish meal production.

The expansion and developing towards more value-added products in the fish processing industry has resulted in an increasing amount of fish offal. Up to now the offal is used as fresh animal feed or it is simply dumped. The drawback of using the fish offal for fresh animal feed is the very short shelf life, already within few

hours is the quality severe reduced. Both solutions are neither environ-



The silage plant.

The silage plant is shown on the following sketch:

and includes:

- Daily storage tank
- crane for mixer
- Hopper for mixing
- Grinder
- Storage bin for offal
- Tank for mixing and dosing of dry chemicals
- Tank for dosing of acid
- Mixer in daily storage tank
- Dispatch pump
- Pump for offal and acid
- Pump for offal

The silage plants are normally designed and dimensioned for each actual project and with production capacities from 2 – 25 tons per hour. The daily storage tank and the grinder limit the capacity of the plant. The typical daily storage tank has a capacity of 30 - 40 tons of silage. Depending on the capacity of the final storage tank and the quality analyses could the daily storage tank be emptied more than once a day. The grinder capacity is depending on the type and size of raw material, the coarseness of the minced product, condition of knives and continuously feeding, but the typical capacity would be 5 – 10 tons per hour.

Silage production

The silage production will complete the utilization of the seafood and fish resources, by introducing the preservation of offal from the production and downgraded fish too small for consumer products by means of

acid, making it into silage, to be sold and distributed for animal feed or for further processing into final feed mix in pellets.

Production of fish silage is from all points of view the cheapest and most efficient preservation method of raw fish and fish offal, leaving out of account the transportation costs.

Both investment in necessary equipment and running costs are less than 25% of alternative methods giving the same results regarding hygienic and nutritive nature if the offal quality is kept good. Silage is considered to have a nutritional effect far above value based on content of protein and energy. This is, in particular, due to the bioavailability of the micronutrients, the relatively intact enzymes and the polyunsaturated fatty acids.

There are no problems with storage of fish silage, and if the acidity is correct, storage life is measured in months or years. In case of long time storage antioxidants such as sodium pyrosulphite or etoxyquin has to be added in order to avoid rancidity of the fat.

Fish silage can be produced on basis of many different preservation methods, using a variety of acids and other additives.

The method is well known and approved by the Danish veterinary authorities.

The method was re-introduced in Poland in March 1993 when the authorities decided not to allow establishment of new fish meal plants due to the environmental problems with these. The silage production proved to be a great success both

from economical and environmental points of view and in 2002 was another large silage plant delivered and implemented by LarEll Associated Consultants. The silage is introduced in the feed for pigs, and the demand was from the beginning much higher than the supply.

Fish silage could be used in feeding mixtures for pigs, cows, chickens, fur animals and farmed fish. The recommended amount in feed mixtures for the different animal varies from species to species.

Fish silage is a stable liquid product with a malty odour that has very good storage characteristics, but which contains all of the water present in the original fish raw material. It is a simple process and one requiring little capital equipment. The use of oily fish may entail oil separation, but this will not be advisable in most cases. An antioxidant could be added in order to protect the fish oil from rancidity.

Almost any fish species can be used for the production of silage. The production of silage includes mincing the material, adding of acid for preservation and then assuring that the whole is well mixed in order to allow the naturally present enzymes to digest the material under the favourable conditions provided by the acid.

There are no problems with storage of fish silage, and if the correct acidity is kept, its storage life is measured in months or years. During storage the silage tends to become smoother in consistency and develops a malty odour. It may be transported; pumped etc. in the normal ways and

the only additional complication is that it can settle particularly during prolonged storage. Thus mixing is necessary before removing from the tanks in order to obtain a representative mixture.

There are changes during storage, the proteins become more soluble and there is an increase in the amount of free fatty acids in the fish oil present, but feeding trials have not shown those changes to be nutritional detrimental.

If the silage is made from very oily fish it is desirable to separate the oil because the oily silage may be unsuitable as a feedstuff and could cause a fishy taint in the flesh of animals fed upon it. But there are no reasons for removing fat from silage intended for mink feeding or for

feeding of piglets and sows when mixed with other feeding stuffs.

In the next number of INFOSAMAK will the utilisation of silage in animal feed be presented and detailed described. In the third and last article will briefly the methods for extrusion of the feed mixtures into dry pellets be presented.

LarEll is at the moment involved in the design and implementation of a large fish processing plant in Abu Simbel, Egypt. The processing plant is designed for a production of 20 tons Nile Perch, Tilapia and Catfish per 8 hours and the total plant will also include processing facilities for making silage and final animal or fish feed.

LarEll Associated Consultants is also - besides design and implementation

of complete fish processing plants with new efficient, environmental friendly and tailor-made processing equipment - engaged with many other projects and tasks such as developing and implementing HACCP systems, Environmental Management Systems, marketing studies, total technical draft projects with investment budgets and layouts or even complete business plan developed for the individual needs. ■

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