

LOC or Live Oil Content

About 80% of the live weight of all marine and aquatic fish species is water. When fish meal is produced, most of this water evaporates, while the **LOC**—short for **Live Oil Content**—remains with the solids and becomes the fat content in the dried product; approximately **four times the LOC value**. To warrant long shelf life of fish meal, the **fat content must not exceed 10%**, which means that the LOC of the raw material must be **less than 2,5%**. Subsequently, **an LOC value determining whether a raw material is 'lean' or 'oily can be set at 2,5%**. For the processing of 'oily' raw material—pelagic harvests, with LOC above 2,5%—a standard **LeanFish** plant can be extended with an **Oil Extraction Package** (see picture on pages 2 & 3), which reduces the oil content in the press cake mixed with the stickwater to a level **corresponding to LOC = 2,5%**.

WLT-Meal or Whole Low Temperature Meal

The term **Whole Meal** means that **all solids** from the raw material and **all the oil** are retained in the product, whereas **LT Meal** or **Low Temperature Meal** suggests that drying takes place at **low and controlled temperatures**. And since all the water evaporates—except a fraction, which remains in the meal as the moisture content—**neither solids nor fluids** are discharged from the plants, thus making them fully **environment-compatible**. Moreover, **LeanFish fish meal plants producing WLT-Meal yield 25% more** than conventional plants disposing of the stickwater.

Enhancement

Fish meal with **high protein content and low in minerals** is in demand for the feeding of juveniles in aquaculture. Digestible proteins are contained in the soft tissues of the raw material; the minerals come from the bones. Fish meal plants can be equipped to **separate the fine fraction of the dried product from the coarse mainstream prior to milling**—known as **Enhancement** (see separate leaflet). Depending on the raw material, the enhanced product **can contain over 80% of digestible protein** and, since the separated fraction is comparatively small, the reduction in the protein content of the much larger volume of standard product is **negligible**.

Odor Control

Odor is controlled by scrubbing the exhaust and injecting a **bio-chemical additive** in the recirculated fluids. The additive develops into a **flora of micro-organisms** that virtually **eat the odor** (see separate leaflet). However, the micro-organisms are sensitive and **cease to live if temperatures in their habitat exceed 50°C**. It has proved less vulnerable and more effective—though also more expensive—to **inject ozone into the scrubber fluids**.



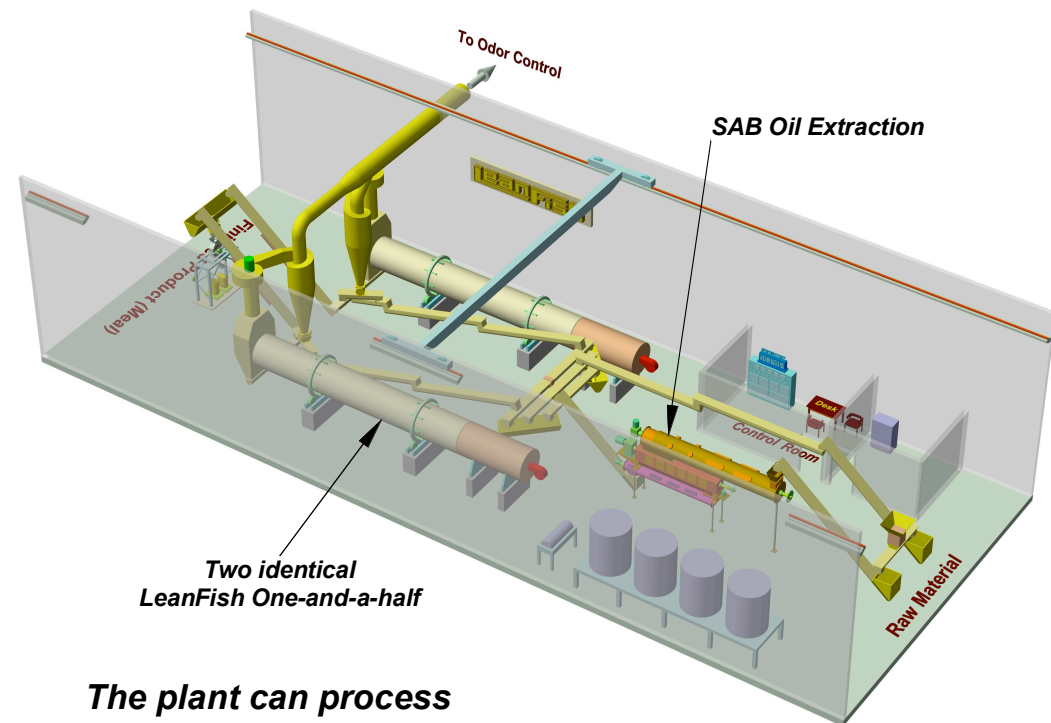
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Glosalir 7, Suite 704; IS-201 Kopavogur; Iceland

**Desk: +354 5622524; Pocket: +354 8961892; Fax: +354 5621592
Skype: LeanFish; eMail: ingvar@ingvar.is; The Web: www.ingvar.is**



LeanFish Combi Size Three



The plant can process 3 mTon/h of 'oily' raw material and render it to WLT-Meal (see page 4). Alternatively, if the stickwater is disposed of, 3000 kg/h of 'oily' material and 1.500 kg/h of 'lean' material can be fed to the plant simultaneously; hence:

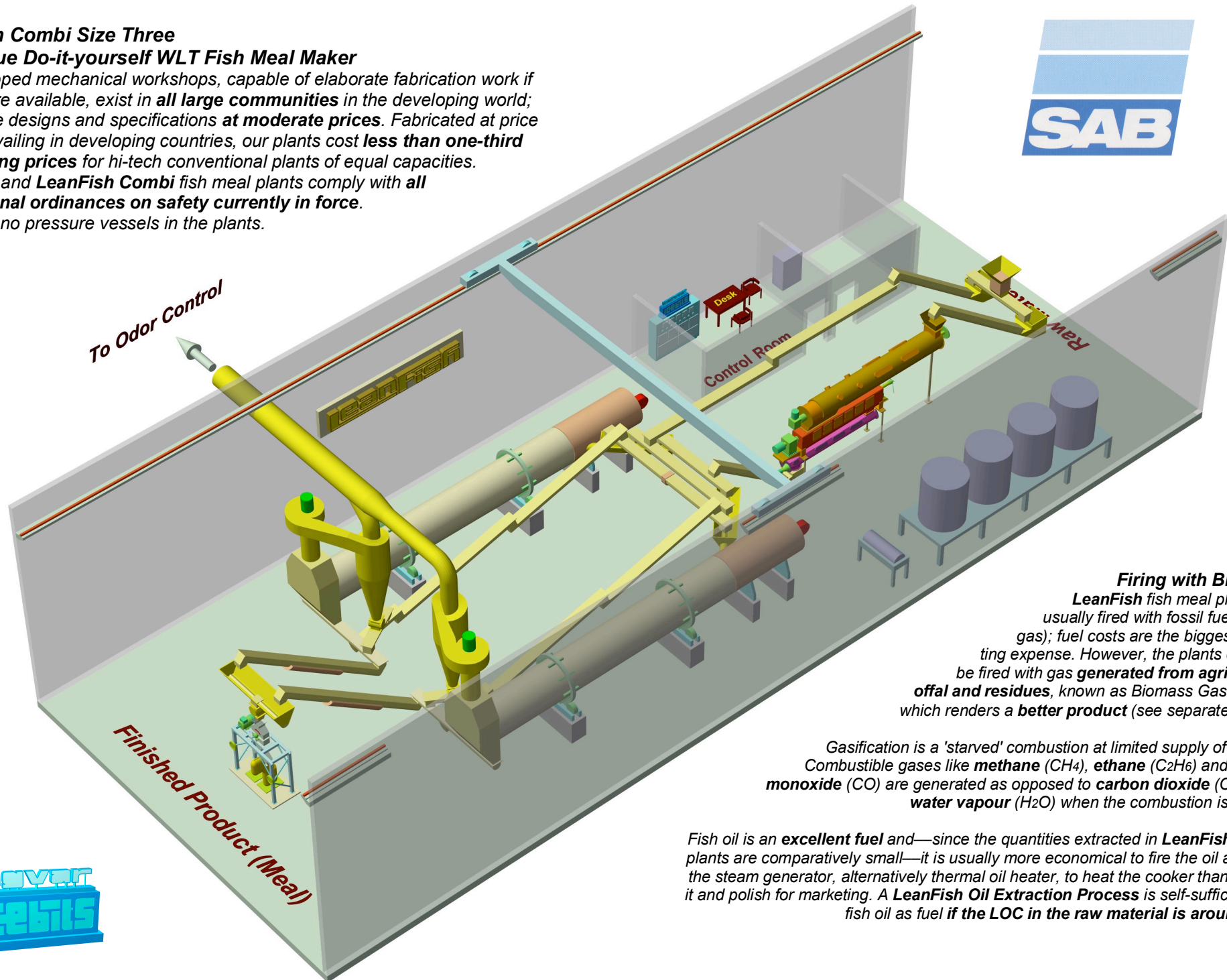
LeanFish is the Final Answer to a Perpetual Question

LeanFish Combi Size Three
the unique Do-it-yourself WLT Fish Meal Maker

Well equipped mechanical workshops, capable of elaborate fabrication work if designs are available, exist in **all large communities** in the developing world; we provide designs and specifications **at moderate prices**. Fabricated at price levels prevailing in developing countries, our plants cost **less than one-third of the going prices** for hi-tech conventional plants of equal capacities.

LeanFish and LeanFish Combi fish meal plants comply with **all international ordinances on safety currently in force**.

There are no pressure vessels in the plants.



Firing with Biomass

LeanFish fish meal plants are usually fired with fossil fuels (oil or gas); fuel costs are the biggest operating expense. However, the plants can also be fired with gas **generated from agricultural offal and residues**, known as Biomass Gasification, which renders a **better product** (see separate leaflet).

Gasification is a 'starved' combustion at limited supply of oxygen. Combustible gases like **methane** (CH₄), **ethane** (C₂H₆) and **carbon monoxide** (CO) are generated as opposed to **carbon dioxide** (CO₂) and **water vapour** (H₂O) when the combustion is normal.

Fish oil is an **excellent fuel** and—since the quantities extracted in **LeanFish Combi** plants are comparatively small—it is usually more economical to fire the oil as fuel in the steam generator, alternatively thermal oil heater, to heat the cooker than to store it and polish for marketing. A **LeanFish Oil Extraction Process** is self-sufficient with fish oil as fuel if the **LOC in the raw material is around 12%**.

