

Memo on refinery study

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Our longterm objective is to secure supplies of oil products at low cost and at the same time to minimize risks of interrupted supply and wild price fluctuations.

Presently Iceland obtains all its oil as refined products at a price which is determined by the Rotterdam Spot Market. To meet our long term objective it is necessary to look for an oil supply system which is more flexible and not so sensitive to spot market fluctuations. The most obvious candidate for such a system is a local refinery, which could obtain crude oil through longterm contracts, as well as buying and selling oil products through the Rotterdam Spot Market.

A local refinery would go some way towards meeting our longterm objective of more secure supply of oil products and more stable prices. However, the cost of crude oil is still the dominating factor in the cost of oil products from such a refinery.

Iceland has relatively abundant hydropower resources. Through electrolyses it is possible to produce hydrogen from water. This method has been used for 25 years to produce locally nitrogen fertilizers. Hydrogen is used in oil refining. If supplied externally there is some scope for reducing the use of crude oil for a given output and therefore reducing the dependance of product prices on crude oil prices. Externally supplied hydrogen also gives increased scope for turning heavy crude or residual oil into light products using hydrocracking and treating. This process is much more capital intensive than normal oil refining, but it reduces the relative importance of crude oil prices. The selection of this process substitutes future high cost crude oil with heavy present investment in hydropower stations, hydrogen electrolysers and an advanced oil refinery.

The aim of the Lummus feasibility study is to compare three alternatives, and find which of them is likely to give the lowest net present cost over a period of 15-20 years.

1. Continue to buy oil products as at present, assuming reasonable real cost increase for oil products, such as 3.5% annual increase, (doubling in 20 years), giving some thought to the penalty associated with uncontrolled supply and price fluctuations.

2. Build a conventional refinery such as scheme 1 in the Lummus proposal, assuming all hydrogen is obtained from the crude, and the price of crude increases as in case 1.

3. Build a refinery using electrically derived hydrogen, supplied at the cost of \$ 1400 per tonne at 1980 prices.* The option here is to use scheme 1, or the L.C. fining unit shown in scheme 3, eliminating as much as possible of other supporting units. These could be added later as extensions to the refinery. In addition to light crude oil, which seems logical for the Icelandic market, it would be interesting to look into the use of relatively heavy but inexpensive crude from Saudi Arabia or similar crude from a different source. By using a heavy crude we are still trying to substitute oil with capital and electrically derived hydrogen. As before we assume that the price of oil in real terms will double in 20 years.

* Assuming 50.000 kW per tonn at \$ 0.017/kWh, and other costs of 15% above those established in report OS80016/JHD08, which uses 1979 prices.

Summary: Iceland is faced with a range of options to satisfy its need for oil products. The present method of buying refined oil products at Rotterdam Spot Market prices represent one extreme of the spectrum with minimum capital investment and high risk of oil price fluctuations.

The other extreme would be to buy heavy crude oil through longterm contracts with an oil producer, while investing in hydropower stations, electrolyzers for hydrogen production and a hydrocracker refinery. This option is characterised with heavy capital investment, but relatively low crude oil cost and correspondingly lower price fluctuations. The aim of the Lummus study is to find the capital cost associated with building refineries of increasing ability to treat heavy crude oil, and thus the tradeoff between capital on the one hand and import oil prices and risk on the other. Hopefully an optimum balance between capital investment and cost of oil supplies can be found.