

IAFMM

FISH OIL BULLETIN

international association of fish meal manufacturers

Hoval House, Orchard Parade, Mutton Lane, Potters Bar, Herts. EN6 3AR, England.
Tel: (Potters Bar) 0707 42343/4/5 Telex: 8811909 London.

No 14 August 1982

RELATIONSHIP BETWEEN IODINE VALUE & THE COST OF HARDENING FISH OIL

1. COST OF HYDROGEN

The Iodine Value (IV) is a measure of the unsaturation (number of double bonds) in an oil. The amount of hydrogen required to saturate a double bond is known theoretically. In practice, allowing 10% excess for losses, the relationship between IV and gas consumed is:

1 cubic metre of hydrogen at 0° and 760 mm Hg pressure is required to reduce the IV of one tonne of oil by one unit.

The IV/melting point relationship of a hardened oil depends on the starting IV of the oil and on the conditions employed in the reaction, e.g. high or low temperature, new or used catalyst etc. For HFO 35°C, which is a melting point commonly used, the IV drop is of the order of the figure given below:

Starting IV	HFO 35 IV	IV drop
200	80	120
90	70	20

The attached graph has been worked out for this product and shows the volume of gas required against the IV of the "soft" fish oil.

The cost of hydrogen in the U.K. at the time of writing is £19.18 per 100 cub. metres. Thus the amount of gas and the August '82 cost of the gas per tonne oil to produce HFO 35 from IVs of 100, 130, 150 and 190 are as follows:

HFO 35

Starting IV	H ₂ volume (m ³ /tonne oil)	H ₂ cost (£/tonne oil)
100	29	5.6
130	56.5	10.84
150	75	14.39
190	111	21.29

The gas cost of other products with different IVs can be worked out in the same way e.g.

Starting IV	150
Product IV	50
IV drop	100
Gas required	100 m ³
Cost/tonne oil	£19.18

The same calculation applies for other oils e.g. soyabean (starting IV 130) hardened to HSBO 35 (IV 70)

IV drop	60
Gas/tonne oil	60 m ³
Cost of gas/tonne oil	£11.51.

2. COST OF CATALYST

The variation in this case is greater depending on the degree of re-use of the catalyst. However, as an approximation the following figures can be used. The catalyst quantity will also vary with the manufacturer and the grade of catalyst. The catalyst should always be specified in terms of % nickel and not % catalyst as the % nickel in commercial catalysts also varies, usually between 18 and 25%. Normally the higher the grade the higher the % nickel of the catalyst, the higher is the price but also the lower is the

amount used, and therefore these factors tend to balance out in practice.

The catalyst used for the costings is of high activity and relatively high cost (£3150 per tonne). The nickel content is 22%. Catalyst costs are governed primarily by the cost of nickel. Some catalyst manufacturers buy back spent catalyst from the hydrogenator - this factor has not been allowed for in the following costs.

The costs are again for the production of HFO 35. For melting points of the order of 48°C the catalyst requirement/cost should be doubled but this figure is considerably affected by the quality of the starting oil.

HFO 35		
Starting IV	% nickel	catalyst cost (£/tonne oil)
100	0.05	7.15
190	0.08	11.45

3. VESSEL TIME

The third and final factor affecting the cost of hydrogenating fish oils with different IVs is the length of time required for the reaction.

The cycle time for a 10/12 tonnes batch autoclave is approximately as follows for HFO 35 with a starting IV of 140:

Action	Hours
Charging	0.5
Heating	1.0
Catalyst addition	0.25
Gas on (reaction time)	2.5
Analytical testing	0.75
Cooling	0.5
Filtering	<u>1.0</u>
Total	6.5

The reaction time varies approximately from 2 hours for starting IV 100 to 3 hours for starting IV 190. The vessel (cycle) time therefore lies between 6 and 7 hours at 100% efficiency of operation. Normal operating efficiency is however about 80% and therefore the time variation is one hour in eight or ± 6.25%. Some hydrogenators consider this time difference to be negligible for costing purposes

particularly if they have spare hardening capacity. Others, whose plants are working at full capacity, will consider that the time difference should be costed, particularly when deciding what price they are prepared to pay for a high IV oil. In the latter case, in the opinion of the writer, the 1982 cost allowance should not be higher than £7.00 per tonne of oil.

SUMMARY

The costs in sections 1,2 and 3 for an HFO 35 prepared from starting oils with I.V.100 and 190 are set out in the following table.

Section	Costs (£/tonne oil)		
	I.V.100	I.V.190	Difference
1. Hydrogen	5.56	21.29	15.73
2. Catalyst	7.15	11.45	4.30
3. Vessel time	-	I.V.100 + £7.00 max	<u>0-7.0</u>
Total extra cost, I.V.190 vs. 100			£20.0 - £27.0

F.V.K.Young
13/8/82

HYDROGEN CONSUMPTION IN PRODUCING PHRO 35°C

