



Trash2Cash Delrapport nr. 2.5

A fish gelatine plant in Hanstholm - a first outline of economics

Delprojekt 2: Hvidfisk – udnyttelse af affald

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A fish gelatine plant in Hanstholm – a first outline of economics

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Kontakt:

Sara Kobbegaard, sak@teknologisk.dk, tlf. 72 20 14 61

Rapporten er udarbejdet som led i projektet **Trash2Cash**

Delprojekt 2: Hvidfisk – udnyttelse af affald

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Projektholder:

Nordsøen Forskerpark, Willemoesvej 2, 9850 Hirtshals
info@nordsoemail.dk, tlf. 98 94 41 88

Faglig projektledelse:

Teknologisk Institut, Teknologiparken, Kongsvang Allé 29, 8000 Aarhus C
keha@teknologisk.dk, tlf. 72 20 21 31

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Indholdsfortegnelse

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Summary

To evaluate the financial and economic aspects of a fish gelatin plant in Hanstholm, a "Greenfield" model has been used. This model starts from nothing, a green field, and looks at the costs to build and manage the new plant. The chemical process industry and the food industry often use this model to get a first estimate of investments, operating costs and revenues.

In our case, only limited information is as yet available, so the calculations need to be continuously updated. However, the first estimate looks favorable. For an investment of about 5,6 MDKK you will get an operation with a margin of almost 50 % and a payback time of 1 year. This is assuming production at full capacity.

Calculations

The first step when using the model is to construct a flow chart for the process and then a material balance. In our case, we can make a simplified schematic diagram:

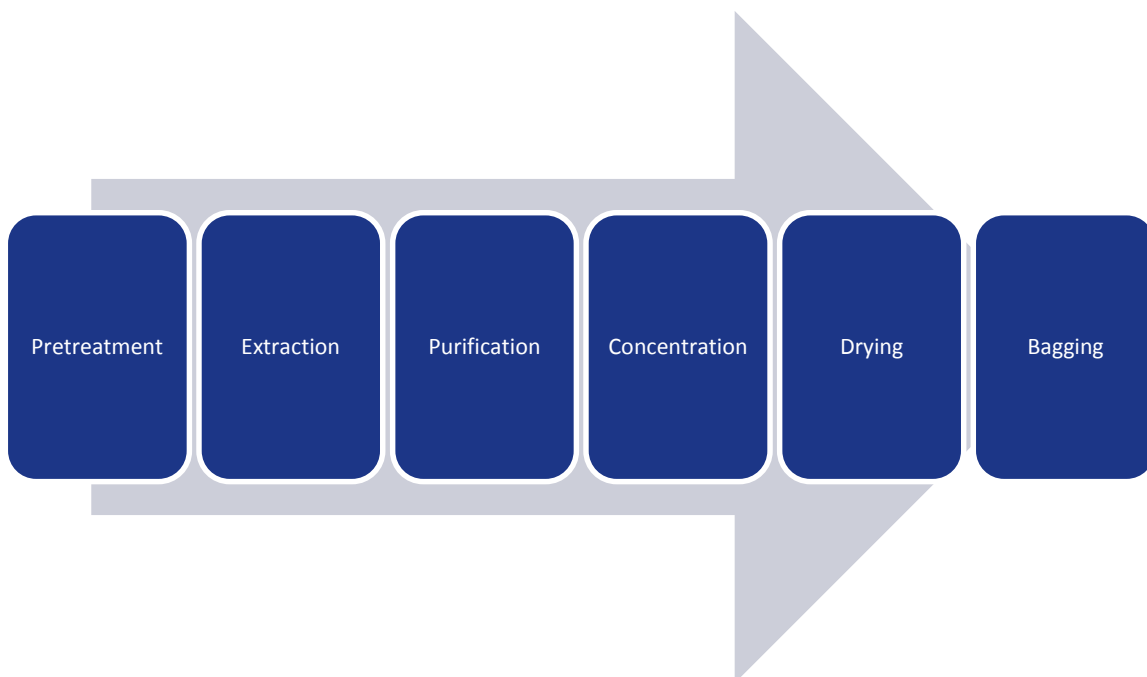


Figure 1. Flow chart of process

We do not yet have data for a material balance; the only thing we know so far is that we want the plant to have a capacity of 150 tons of fish gelatin per year. Given 1 800 working hours per year, this means 83 kg/hour, or about 100 kg per hour in design capacity. The yield of gelatin from fish skins is set to 10 %.

1.1. Major equipment costs

The next step is to estimate the cost of major equipment in the process. This is often reasonably easy to do. Later on, other costs will be related to the major equipment costs. Table 1 gives an estimate for the fish gelatin plant.

Table 1. Major equipment costs, MEC, for a 150 MT/year gelatin plant

Item	Item description	Size	Size	Delivered cost kDKK	No of items	Total costs kDKK	% of MEC
1	Pretreatment tank	5 m ³		100	1	100	4,08
2	Acid tank and dosage	1 m ³		75	1	75	3,06
3	Extraction tanks	5 m ³		100	3	300	12,24
4	Tricanter	150 kg/h		600	1	600	24,49
5	Pumps			50	4	200	8,16
6	Ion exchange, clarification			75	1	75	3,06
7	Evaporators			300	1	300	12,24
8	Spraydrier	100 kg/h		500	1	500	20,41
9	Silo	2 m ³		33	3	100	4,08
10	Bagging equipment			200	1	200	8,16
	Total MEC					2450	100

The tricanter and the spray drier are the critical investments. Care should be taken in the next steps to get relevant offers for these machines.

We now need to determine the total fixed capital investment, and several expenditures have to be added. These are calculated as a percentage of the major equipment cost, based on decades of experience from the chemical and food industries. Table 2 gives an overview.

Table 2. Estimation of total fixed capital, based on total equipment costs

Item	Item description	% of MEC	Cost, kDKK	% of total fixed capital	Comments
1	Major equipment (MEC)	100	2450	44,04	
2	Installation costs	30	735	13,21	
3	Instrumentation and control	10	245	4,40	
4	Piping	30	735	13,21	
5	Electrical	10	245	4,40	
6	Buildings	30	0	0,00	Existing
7	Yard improvements	10	0	0,00	No need
8	Service Facilities	20	0	0,00	Existing
9	Land	6	0	0,00	Existing
10	Engineering and supervision	25	613	11,02	
11	Construction Expenses (Sum 1-9)	10	245	4,40	
12	Contractor fee (Sum 1-9)	5	123	2,21	
13	Contingency	7	172	3,09	
	Total fixed capital Investment		5563	100	

Thus, the investment will be about 5,6 MDKK.

The fixed capital costs per year consist mainly of depreciation and insurance. Depreciation on a 10 year base is calculated on item 1-8 and 10-13 in Table 2. It comes out as 556 kDKK. Insurance is a small cost, and can be put in later.

1.2. Variable costs

We turn now to variable costs, mainly raw material, utilities and labor.

Table 3. Raw material costs and utilities

Raw materials					
Item	Unit costs	unit	Total quantity, ton	Costs kDKK	Comments
Fish skins, Hanstholm	2,25	DKK/kg	1000	2250	Yield 10 %
Fish skins, Poland	2,5	DKK/kg	500	1250	Yield 10 %
Chemicals	10	DKK/kg	50	500	Good estimation needs material balance
Total raw material costs				4000	
Utilities					
Item			Total quantity, kWh or m ³		
Electricity	0,75	DKK/kWh	500	375	Good estimation needs material balance
Water	0,5	DKK/m ³	900	450	Good estimation needs material balance
Total utilities				825	

At this stage, we assume that water purification will not add to the costs. A gelatin plant uses a lot of water, but the used water will contain only material which can be handled by the municipal purification plant.

Table 4. Labor and other costs

	Number of persons	kDKK/person	Shifts	Fraction	Cost, kDKK	Comments
Labor	1	500	1		500	
Supervision			of labor	0,2	100	
Maintenance			of MEC	0,05	123	
Operating supplies			of Tot Raw Mat	0,005	20	
General plant overhead			of labor	0,5	250	
Contingency			of labor	0,05	115	
Marketing and sales						To be added later
Total labor and other costs					1108	

1.3. Operating revenue

We now have information to make the first estimation of operating revenue. Data from the earlier tables are collected in Table 5.

Table 5. Operating revenue, fish gelatin project, first estimate

Income	kDKK	Comments
Fish gelatin	12 326	Price ex works 10-12 €/kg, Exchange rate 7,47 150 ton
Total income	12 326	
Expenses		
Fixed capital costs	556	Depreciation, 10 years
Raw material costs	4000	Skins, chemicals
Utilities costs	825	Water, electricity
Labor, overhead	1108	Labor, maintenance, general plant overhead
Marketing and sales	0	To be added later
Total expenses	6489	
Operating revenue	5 837	Operating margin 47 %

The sales price of the fish gelatin is the most critical item in the calculation. A decrease in the sales price of 10 % means a decrease in Operating revenues of 1,2 MDKK. On the cost side, the cost of the fish skins is the most important. A 10 % increase in price means a decrease of 350 kDKK in Operating revenues.