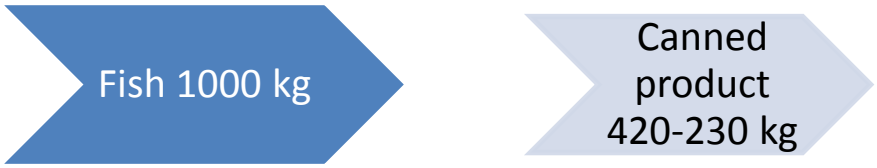
Canned Fish Production

1. Background Information

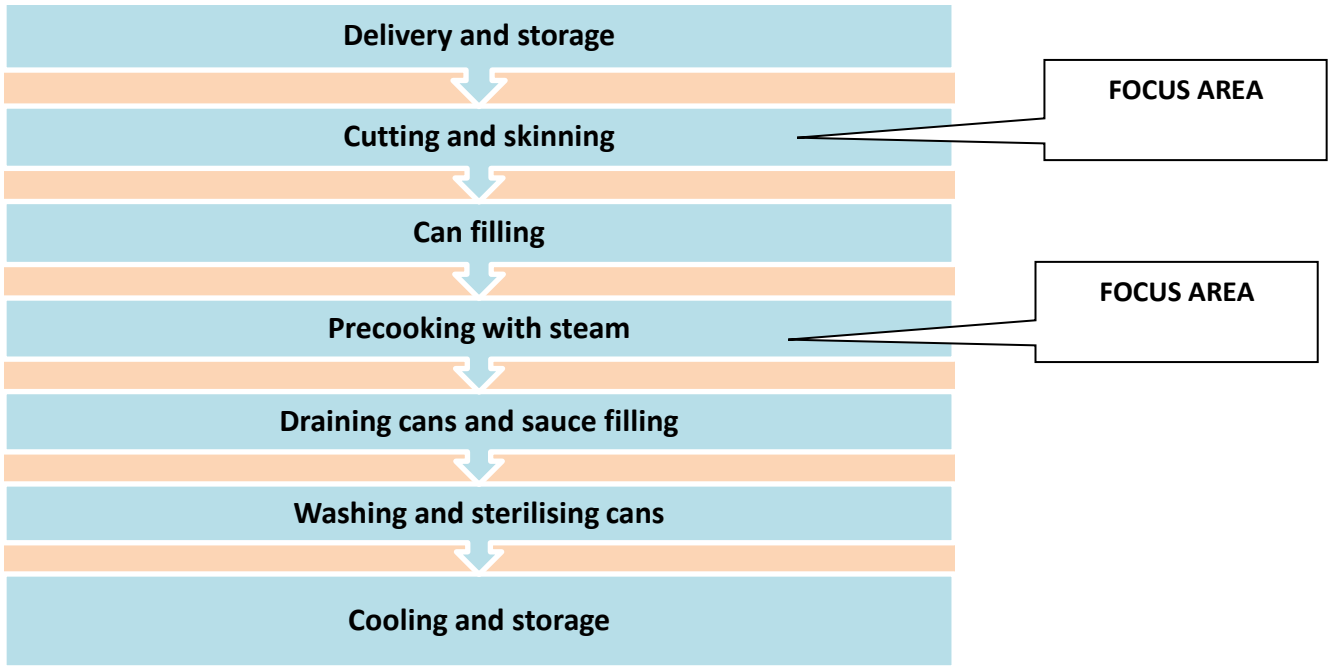
Major inputs and outputs at company system boundary for the fish canning process (**per 1t of fish**)



Other INPUTS	*Non Product OUTPUTS*

• Water 15m^3
• Energy 150-190 KWh
• Chemicals
	• Solid waste
	  • 250kg heads/entrails
	  • 100-150kg bones
	• Wastewater
	BOD 52 kg; COD 116 kg, N 3 kg

2. Process flow diagram



Following the detailed analysis based on NPOs costs, major losses are associated with raw material (fish) and energy flows and two focus areas have been idetified: precooking of fish and cutting/skinning.

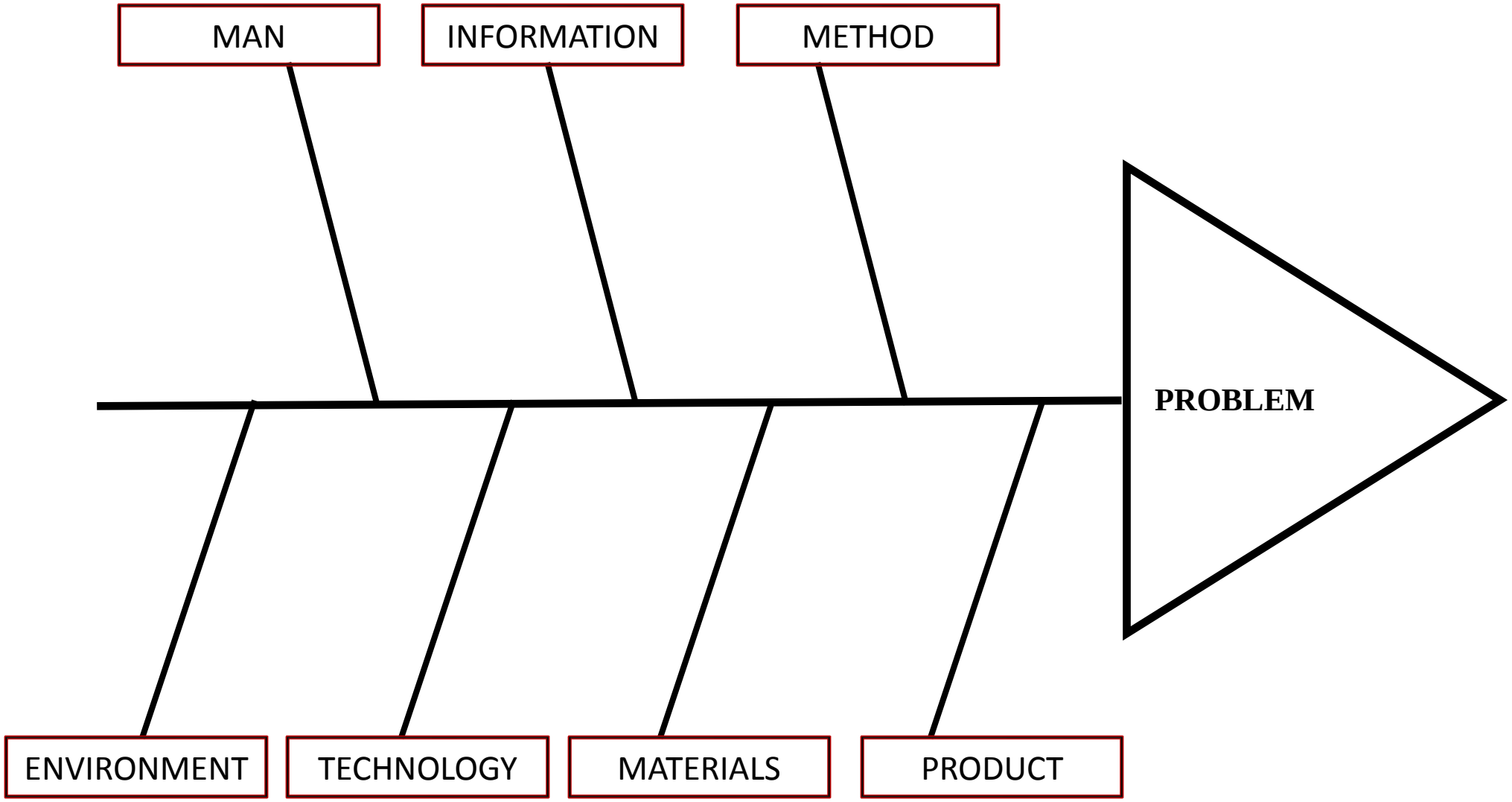
TEST Exercise Cause analysis and option generation

Pre-cooking is done using steam in open cans. Cooking equipment is open and it is not well insulated (there are visible high losses of steam). The liquid generated from the cooking process contains dissolved proteins and fat (7 g of oil per kilogram of fish). Cooking liquours are discharged into the wastewater (there is an effective drainage within the cooking room which collects all waste water with high oil content; the fat is regularly removed by water stream and manually). There is no wastewater treatment facility except screens. Out of specification products were often recorded (probably due to overcooking and/or low quality of input fish).

TASKS

- **Split into groups**
- **Identify causes of losses within the focus areas (cutting/skinning and pre-cooking processes)**, focusing on raw material (fish) and energy flows (utilize the fish bone template)
- **Genarate options for reduction of losses for each cause identified in the previous step, within the focus area**. YOUR GOAL AT THIS STAGE IS NOT TO FIND FEASIBLE MEASURES BUT TO GENERATE AS MANY OPTIONS AS POSSIBLE
- Discuss your experience in a plenary

TEST Exercise Cause analysis and option generation



TEST Exercise Cause analysis and option generation

SOLUTION - Example of information which can be found in resource efficiency branch specific manuals

Examples of causes of losses:

- low quality of input fish (too little ice utilised within previous steps)
- raw material with high content of fat
- equipment design causing losses, no capture of organic matter and oil
- poor temperature/cooking cycle operational control
- poor maintenance

Examples of improvement options:

- Use enough ice to secure product quality (avoid out of specification product which is not only the result of ovecooking).
- Valorisation of organic waste – production of oil and fish meal (through pressing and drying)
- The cooking water can be reused repeatedly if the oil is skimmed off and the oil can be sold for fish oil production. The capital investment required for this option is low.
- Cookers should be insulated and designed so that steam loss is minimised. Installation of a damper in the exhaust of the cooker, combined with automatic or manual control, can also be effective in reducing steam losses.
- As an alternative, microwave cooking has been introduced in some plants for pre-cooking processes. The investments required are high, but water consumption is almost eliminated and energy consumption is reduced considerably, especially for fish in tall cans. Microwave cooking may increase product yield, but the process needs careful examination before changes are implemented because it may change the quality of the product.
- Skimming of the oil from the cooking liquors will increase the income from selling the oil. This requires no investment, only a change in working procedures. The aqueous phase left after oil skimming can be used for production of fish soup.
- As liquid is drained off it should be collected in a storage vessel. The liquid is warm, so the oil separates easily and can be removed from the surface by scraping or suction. This can significantly reduce the pollution load of wastewaters generated from the processing of oily species, and the oil can be sold as fish oil. It is much more efficient to recover the oil from the liquid immediately after draining, rather than at a later stage, as some of it will be emulsified in the water. For large-scale production it is possible to use a centrifuge to separate the oil, but the investment required is high and requires large volumes to be cost effective.

Source: Cleaner Production in Fish Processing (UNEP manual)