SINTEF Energi AS
SINTEF Energy Research

P.O. Box: 4761 Sluppen
Address: NO-7465 Trondheim,
Reception: Sem Sælands vei 11
Telephone: +47 73 59 72 00
Telefax: +47 73 59 72 50

www.sintef.no/energy

Enterprise / VAT No.:
NO 939 350 675 MVA

PROJECT MEMO

MEMO CONCERNS

Methodology for comperative LCA on emerging technologies- case study of superchilled haddock filets versus fresh haddock filets

DISTRIBUTION
Grete Tangen

AN NO.	CLASSIFICATION	REVIEWED BY
AN nr		Erlend Indergård

ELECTRONIC FILE CODE	AUTHOR(S)	DATE
1009201081	Magnus Grinde	2010-09-20
PROJECT NO.		NO. OF PAGES
16x895.03		3

DIVISION	LOCATION	LOCAL FAX
Energy Processes	Kolbjørn Heies vei 1D	

BACKGROUND

LCA addresses the environmental aspects of products/systems and is an instrument to quantify all impacts of the entire energy supply chain to obtain the cumulative energy demand. In Creativ there is of interest to make a comperative LCA study of superchilled haddock filets versus fresh haddock filets included transport from Norway to France. This document is delivery 1.3.1 "Develop methodology for LCA on emerging technologies", and presents the methodology to perform this comperative LCA study.

LCA METHODOLOGY

Life Cycle Assessment (LCA) is a standardized tool (ISO 14040-14049) that considers all stages of the life cycle of a product, technology or event, covering all environmental impact categories. This means that an LCA shows the total impact of each category, caused by the existence of a product, ensuring a holistic perspective. However, when carrying out an LCA on an emerging technology, such as Superchilling (SC), the main objective should be to **compare the environmental performance of a system utilizing the novel technology with the environmental performance of conventional systems**. This implies the possibility to leave out processes shared by the two systems as contributions from such processes will be the same for both systems. Such simplifications can reduce the workload considerably, but one should always remember that the final results will then only represent the relative difference in environmental impacts.

In order to ensure a fair comparison, one needs a common ‘functional unit’ which can be used to express the results. In the case of superchilled fish filets, one kilogram edible filet is the most obvious functional unit as it describes the very ‘function’ of the system.

The first phase in a life cycle assessment is definition of goal and scope. Apart from describing the ‘functional unit’, the goal and scope description should address the overall approach used to establish the system boundaries. The system boundaries determine which unit processes are included in the LCA and must reflect the goal of the study.

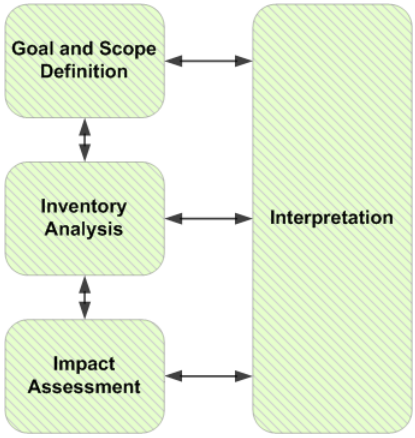

Figure 1: Illustration of LCA phases

An LCA should aim to cover all relevant processes and impact categories. Some of the most common environmental impact categories, that at least should be included in a study, are:

- Global Warming Potential (GWP) [kg CO2 equiv.]
- Acidification Potential (AP) [kg SO2 equiv.]
- Eutrophication Potential (EP) [kg PO43- equiv.]
- Human Toxicity Potential (HTP) [1.4-DCB equiv.]
- Eco Toxicity Potential (ETP) [1.4-DCB equiv.]
- Ozone Depletion Potential (ODP) [CFC-11 equiv.]

Of course, we often don’t know which processes that have significant contributions before we have carried out the assessment. Still, processes may sometimes be excluded, when defining the scope, based on qualified assumptions. For large, complex systems, it can be a good idea to carry out a so-called ‘screening’ (i.e. a rough assessment), in order to get a better overview before defining the system boundaries of the main study. This will be done in this case of comparative LCA on Superchilling. Figure 2 illustrates the processes included in the screening.

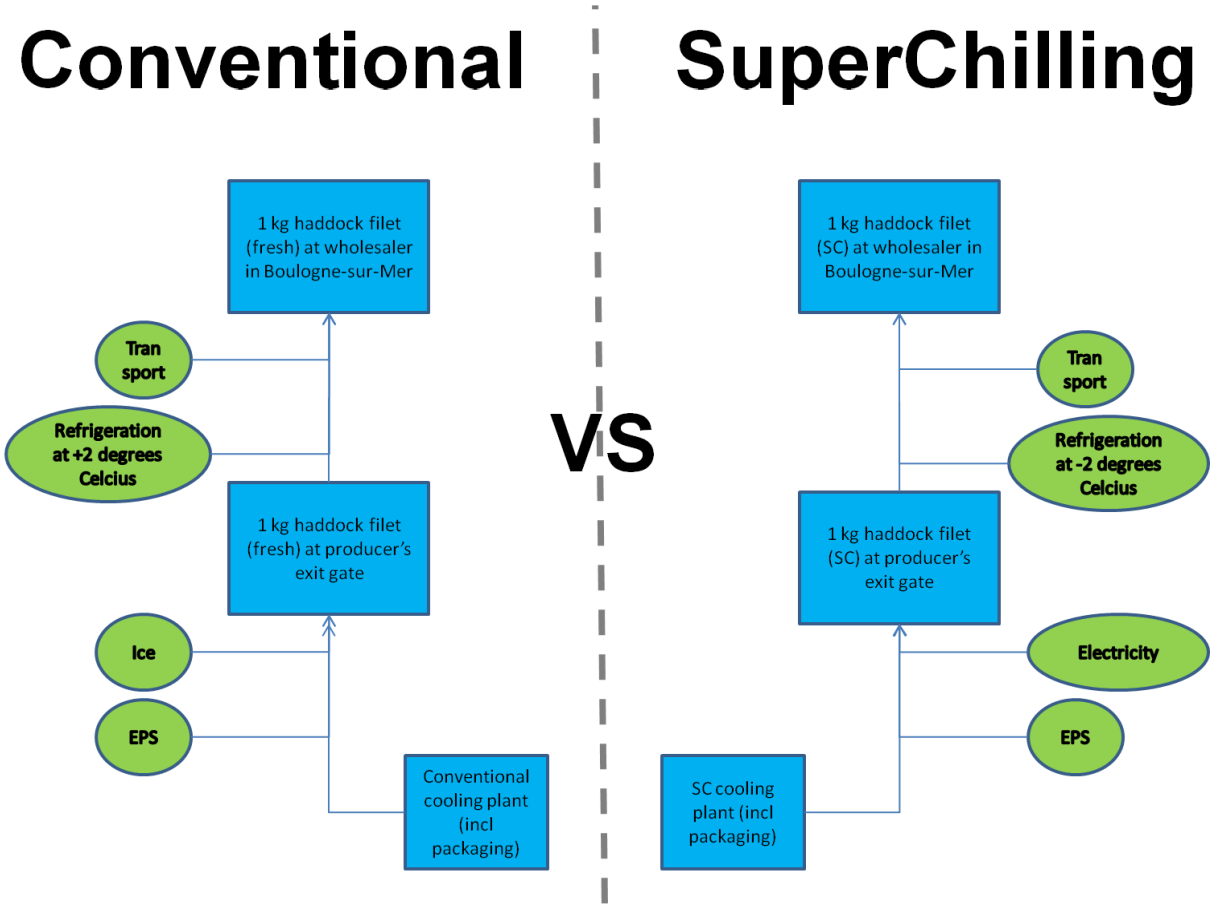

Figure 2: *Overview of structure in screening*

The second phase is the inventory analysis, which includes data collection and compilation of inventory. LCA is an iterative technique, and as data and information are collected, various aspects of the scope may require modification in order to meet the original goal of the study. In some cases, the goal of the study itself may be revised due to unforeseen limitations, constraints or as a result of additional information.

In the third phase, impact assessment, calculations of total environmental impacts are carried out using data from both the compiled inventory as well as data from the LCA practitioner's choice of impact assessment method. Eco-indicator 99 is one of the most widely used impact assessment methods, and will also be applied for this case. The step of calculating impact potentials is termed characterization. Other steps are normalization and weighting, but these are both voluntary. Normalization provides a basis for comparing different types of environmental impact categories (all impacts get the same unit). Weighting implies assigning a weighting factor to each impact category depending on the relative importance. Weighting is not allowed in a comparative LCA, according the ISO standard, and will therefore not be done in this case.

The last phase in an LCA is the interpretation phase. Analysis of the results and sensitivity analysis are the most important aspects of this phase. Sometimes an independent critical review is necessary, especially when comparisons are made that are used in the public domain.