

FISCH Thematic Workgroup

“Sustainable development”

Date : 07/04/2009

From : Steven De Meester, Jo Dewulf (EnVOC, UGent), Carl Van der Auwera (essencia)

Subject: Thematic workgroup on “Sustainable development” dd. 26/03/09

On March, 26th, 2009, a Thematic Workgroup (TWG) meeting on “Sustainable development” was organized by J. Dewulf, S. De Meester (EnVOC, UGent) and C. Van der Auwera (essencia) in the framework of the IWT Feasibility Study FISCH (Flanders strategic Initiative for Sustainable CHemistry) at the Diamant building (Brussels). In this Report, the findings of this TWG are summarized.

1. Attendees

Industry

essencia/innovation:	Carl Van der Auwera
essencia/product safety:	Tine Cattoor
essencia/Federplast:	Geert Scheys
essencia/REACH+GHS:	Serge Kwasniewski
essencia/REACH+GHS:	Saskia Walraedt
Polygonia/Federplast:	Sarah Gillis
Oleon:	Ward Huybrechts
Ecover:	Dirk Develter
Solvay:	Charle Petré
Umicore:	Marleen Esprit
Umicore:	Benedicte Robertz
Janssen Pharmaceutica:	Peter Van Broeck
CENTEXBEL:	Bob Vander Beke

Knowledge-based Centers

Universiteit Gent:	Jo Dewulf
Universiteit Gent:	Steven De Meester
Universiteit Gent:	Geert Van der Vorst
KULeuven:	Karel Van Acker
KULeuven:	Chantal Block
Universiteit Antwerpen:	Genserik Reniers
Universiteit Antwerpen:	Marian Deblonde
VUB:	Willy Baeyens
VITO:	Peter Stouthuysen
FlandersInShape:	Catherine Decouttere

Representatives

BBL:	Esmeralda Borgo
------	-----------------

Facilitator

PANTOPICON:	Michael Van Lieshout
PANTOPICON:	Nicole Rijkens

2. Introduction

FISCH is a feasibility study under the authority of essenscia and financed by IWT. The main goal of the study is making a business plan to significantly boost the competitiveness of the Flemish chemical industry by implementing sustainable development as an innovative strategy. This study can be seen as a regional branch of the bigger European Technology Platform for Sustainable Chemistry 'Suschem'.

So far, several technical themes have been identified from the list of Suschem technical themes as possible breakthrough themes for the Flemish industry value chain for chemicals. These themes are now classified in 3 covering domains:

- 1. Green feedstock*
- 2. Building block and energy effective process*
- 3. Effective chemical product*

If we consider the third domain broadly, including use, disposal and processing, these 3 domains represent the life cycle of a product (or service). The goal of this workshop (TWG) is to work horizontally above the 3 domains and to come to a coherent vision on sustainable development in Flanders, to make sure that the life cycles of all chemical products (chemical product = atom, molecule, chemical, material and their mixtures), thus representing the complete Flemish chemical value chain, are heading in the right "sustainable" direction and that we come to criteria, measurement systems and an organizational structure that helps us heading in that direction.

The meeting started with a presentation of prof. Dewulf, who gave a short introduction on the FISCH study and on the goal of this workshop. Michael Van Lieshout (Pantopicon), the facilitator, followed this presentation with an overview of the more practical side and the way we would try to find the right conclusions.

3. Characteristics of sustainable chemistry in Flanders

The concept of sustainable development is getting widespread and industries are more and more convinced that this concept is necessary to take the challenges of the future and remain competitive. But this concept may not become hot air. The aim of the first part of the workshop was to give a clear meaning to the concept of sustainable development, more particularly when it will be implemented in the Flemish chemical sector.

Searching for characteristics of sustainable chemistry in Flanders was considered from two different perspectives:

1. From the inside to the outside
2. From the outside to the inside

The starting point of this discussion was to look at the 3 area's that are covered by sustainable development: the 3P's: People, Planet, Profit.



Inside to outside

The discussion was held in 2 groups each divided in 3 subgroups. The small groups each covered one of the 3 P's by thinking about what each P should contain to be sustainable. Afterwards the results were merged and discussed.

PROFIT

As being the most important P for industries, the Profit area was discussed first. It was stated that competitiveness is of the utmost importance for the (chemical) industry and that sustainable development can be a good approach or will even be necessary in the long-term, but that short-term profitability cannot be neglected. Investments that are made have to give returns in a term that is viable for the company. So not only a sustainable long-term plan has to be made, but good cost management in the short-term will also be necessary. This could contain good cost containment with internalization of social and environmental costs and could be aided by fair contributions, subsidies and bonuses. The question was raised if government and banks need to be involved in this process and how and when?

Chemistry exists to meet the needs of society. So when making products there needs to be a thorough research to the demand-side to avoid useless efforts. By meeting the needs of society, chemical industry can contribute to a higher welfare of regions, which will not only result in a better quality of life, but can also increase spending power, eventually paying back delivered efforts and increasing competitiveness. But, in the context of sustainable development, welfare has to be seen broader than the GNP. Another indicator was mentioned: the ISEW (index for sustainable economic welfare), that looks broader than pure economics and also takes into account ecological and social matters.

Keeping this in mind we have to use our strongest points to survive in the competitive future: knowledge and innovation. Indeed, finding 'blue oceans' can position us internationally and put us on the map as a creative and competitive chemical sector, exporting goods and knowledge. SMEs will have an important role in this innovation process, so they have to be involved and expanded. Flanders is a small region, but we can use this as an advantage by collaboration with open exchange of knowledge and streams through the complete chemical value chain. For this purpose we should stress the common interests instead of the conflicting interests.

Another important point mentioned was the depletion of resources with increase in price as a consequence. It will be important that we find alternative resources and that we use energy and resources as effectively as possible. This means doing more with less: developing chemical products with less material and energy waste, but also developing products with a higher added value, a longer life span and products that are modular and multifunctional, but still keeping a fair price. In this way sustainable development can really be an opportunity instead of an obstacle. But it has to remain a choice, not an obligation.

Maybe not directly related with profits, but also mentioned was the responsibility to society and the global living environment with involvement from all stakeholders. This could result in a better image which could also contribute to competitiveness (e.g. better sales from products with labels).

PEOPLE

Industry exists to fill in the needs of society. So the most obvious point in the people area of sustainable development is delivering products and services that are designed to fill in the needs of the (local) community, safe and at a fair price, so that the products and services are accessible for the destined community.

But of course people are involved in the production process of these products or services, so social conditions (Specifically mentioned are: working conditions, safety (working accidents), employee involvement, job security, stability, child labor, work satisfaction and motivation, distance to work and traffic jams, man/woman, ...) throughout the complete chemical value chain have to fulfill standard norms (questions about differences between cultures/basic conditions). Remark the complete chemical value chain, so from the extraction of the resources till the end-of-life disposal and processing. Furthermore there are several effects

resulting from all processes that can be a threat for EHS systems (e.g. impacts from toxicity, emissions, ...). These effects need to be carefully assessed and limited through the value chain. In general, chemistry can become a leading industrial sector in sustainable development and can stimulate societal matters like overall happiness and development, education and knowledge (of employees and society), employment (for people with diverse qualifications),... It is clear that ethic decision taking, with involvement of all stakeholders (employees, consumers,...), will be important in sustainable development and that the boundaries have to lie throughout the value chain and life cycle of products. Companies will be more and more obliged to have a look on the complete picture of this, limiting impacts and improving social conditions, with fair distribution of the created added value among parties involved. It is less clear how far the responsibilities can go to be practicable.

PLANET

As being the most obvious P of the 3P's the Planet area was discussed as last one. Not in the least to stress the fact that sustainable development is broader than the ecological considerations as most people still think, but that the People and Profit aspects are as important.

Earth's carrying capacity is recognized as being the biggest challenge for the future. In this workshop the depletion of resources (fossils), availability of water, climate change and decrease in biodiversity were recognized as being very important ecological challenges. In this framework, the concept of industrial ecology, with closed loop thinking, will gain more and more importance to increase overall efficiency and effectiveness.

When doing chemistry everything starts with resources, so several matters have to be taken into account concerning this:

- extraction
- use
- consumption
- availability (also competition with other needs like food must be considered)
- renewability/sustainability
- waste/emissions
- energy usage to obtain and transport to deliver the resources
- ...

After extraction, the resources reach the plant where they are processed. In this phase it is necessary to have an energy efficient process and to make optimal use of the available

materials. In an ideal situation this results in low energy, zero-waste and -emissions and cradle to cradle processes.

The result of this process is a product or service. The products will need to be optimally and safely produced, serviced, used, consumed and processed. This means that the processes are only executed if really needed (fill in a need), the materials used in the product are well considered (have the right value and aren't wasted) and are not toxic, that the products are used efficiently for all functions possible, that they are used with minimized consumption and that they are made or biodegradable or recyclable (through several life cycles). Also waste, emissions, energy and material-use during the use, disposal and transport phases have to be considered. So again in this area of sustainable development, collaboration and overview of the whole chemical value chain seems to be necessary.

Special in this area is that we are facing a historical burden on the environment and that it might be feasible to clean up that burden too. Carbon sequestration can be given as an example.

CONCLUSIONS

The most important conclusion of this part of the workshop is that sustainable chemistry cannot stop at chemicals, but that sustainable development has to be considered throughout the complete value chain. Also the boundaries in space need to be extended. In future it seems inconceivable that companies don't know where their resources come from. To become more sustainable one needs information on all phases of the life cycle beyond the own borders. It is stated that the chemical industry can be a real example of sustainable development with a good image and confidence from stakeholders and society. But for the purpose of value chain management and image it is essential that industries will work transparently and collaborate openly.

Outside to inside

Chemistry has seriously increased the quality of life the last decades and certainly the last 50 years, resulting in welfare and a growing human population. But science & technology in general, hand in hand with modern capitalism have created several challenges for present and future generations. As scientists always search for solutions, the question was raised here in which societal and environmental challenges the chemical industry can be helpful.

These are the challenges mentioned in the 2 groups:

- Climate change
- (Clean) water scarcity
- The food issue
- Health care
- Transport
- Clean air
- Knowledge, education and consciousness-raising
- Keeping welfare in times of scarcity (dematerialization)
- Resource and energy scarcity
- Cultural inheritance
- Equity
- Sustainable building
- Correcting historical mistakes
- Waste
- Biodiversity

The concept of sustainable development is very broad and it is believed that it is broad enough to help facing most of the challenges society faces today. Indeed, the conclusion of the first part of the workshop might be that chemistry is ubiquitous and at the basis of many human activities, so that sustainable development in the complete chemical value chain, with application of the right criteria in the 3P areas, will lead to a more sustainable humanity.

3. Measuring sustainable development (afternoon)

Knowing the importance and the content of sustainable development in the Flemish chemical industry, an attempt was made to find clear indicators to measure the effectiveness of the implementation of this concept.

Again, the workshop was divided into 2 groups with 3 subgroups each. After the discussion in small groups, the 3 subgroups put together their proposed focuses for indicators to recognize the most obvious and most needed accents in the final set of indicators (Table 1).

A much more detailed discussion is needed, but in the perspective of the feasibility study FISCH it will do as a first move to the final set.

Table 1: proposed focuses for indicators for sustainable development

People	Planet	Profit
<p>As a starting point for labour conditions, the ILO (International Labour Organization) conventions were mentioned</p> <p>Points mentioned more specifically:</p> <ul style="list-style-type: none"> - Employment - Health care (positive (e.g. by welfare) and negative aspects on everyone that gets in contact with the chemical value chain, e.g. people living in the neighbourhood of a plant) - Fulfilling the needs of society by delivering a product or service - Child labour (value chain) - Safety (e.g. toxics, accidents) - Quality and diversity of jobs - Education (employees + society, sustainable development) - Accessibility for consumers - Price - Interaction with stakeholders - Value chain management and partnerships - Overall happiness employees (e.g. satisfaction 	<p>LCA is considered to be a good starting point for ecological assessments</p> <p>Points mentioned more specifically:</p> <ul style="list-style-type: none"> - Resource and energy usage and efficiency (availability) - Exergy analysis - Mass balancing - Pollution (air, soil, water) - Waste (and the different kinds of waste) - Biodiversity (direct and indirect) - Industrial ecology (taking back of a product) - Recyclability of a product and amount of recycled material in the product - Climate change (CO₂ eq.) - Water balance (availability) - Distribution sustainable resources vs. non sustainable resources - Solvents - Eco-consciousness - Valorisation of streams (recuperation) - Toxic and hazardous substances - Toxic residues (with bioaccumulation) - Emissions 	<ul style="list-style-type: none"> - Return on investment - Costs (minimize LCC) - Innovation - Profits (e.g. % profit per innovation in a plant, % profit per education) - Distribution of the added value throughout the value chain - Evolution of SMEs - Ethical investments (sustainable plants & technologies) - Taxes, subsidies, contributions, bonuses - General turnover (plant) - Turnover by sustainable development (plant) - Labelling - R&D investments (e.g. number of researchers) - Price of a sustainable product vs. regular - Added value created <p>Point of discussion: Are economical growth and internationalization (with export) necessary for sustainable development? Or are they a result of a successful implementation of sustainable development (as an innovative strategy)</p>

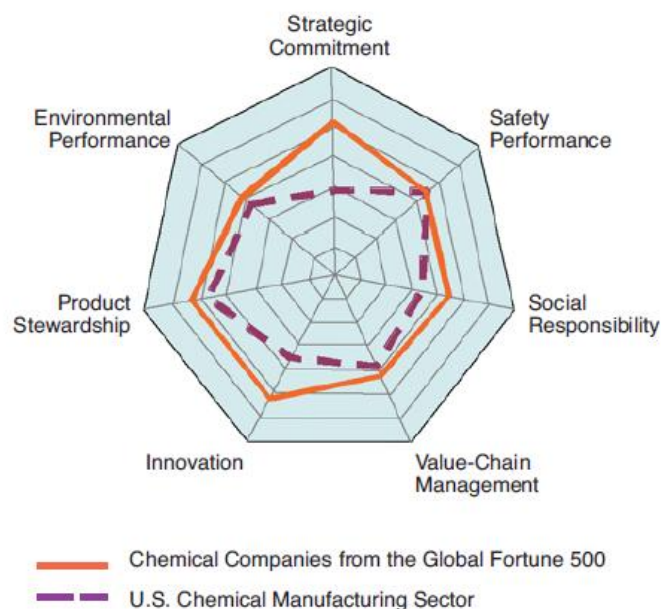
in work) and neighbours - Open house days - Ombudsmen		
---	--	--

Horizontal

Societal responsibility (long-term anchoring), product stewardship, product information, transparency (inside/outside), sustainability reporting, possibility to use products or services in a sustainable way, sensitization, partnerships and cluster forming, logistics, transport (materials and people), international benchmarking (e.g. top 10 world energy and water efficiency, comparison BAT), ethics

There will be a need for constant questioning whether the criteria of sustainable development are still valid and whether they are followed up correctly. This way sustainability can be used as the unique criterion for the assessment of decisions. Examples of questions to be answered by the criteria: are the processes sustainable and necessary, are there better alternatives, do the products meet the needs of society, ...

The final comparison with other sets of indicators will be for later work, but a good example can be taken from the already existing AIChE-index (American Institute for Chemical Engineers).



Without mentioning this index in advance, the 7 categories of the index indeed seem to give a good example for a possible Flemish index for assessing at the company level. Most indices take into account environmental performance, social responsibility and safety performance, but this index also puts attention on value chain management, product stewardship and

innovation. These matters are often forgotten in other sustainability assessment methods, but receive more and more attention nowadays, as can also be concluded from the results of this workshop. On the company level strategic commitment is an important criterion and can evaluate issues regarding sustainable development like transparency, reporting, third party ratings,... The final assessment method to be used in the Flemish chemical industry will also need more economic benchmarks. Standard examples are LCC and CBA. More information on other assessment methods will be delivered as WP1b in the final FISCH document.

5. Potential organization of an O⁶platform/counter for sustainable development in FISCH

For the practical implementation of sustainable development in the Flemish chemical value chain, with the right criteria and indicators, the potential organization of an O⁶platform/counter was discussed. For this purpose the TWG was divided in 3 groups:

- Essenscia members
- Industrial employees
- Non industrial scientists

This set-up made it possible to result in 3 different points of view which could be compared afterwards. It was remarkable to notice that the 3 groups had similar organizational structures in mind. Here, the emerging overall structure is mentioned (Table 2) and followed by the differences between the 3 groups (Table 3). It seemed that a platform/counter needs to be available that manages the sustainable development of the Flemish industry value chain for chemicals.

Table 2: Properties of a potential O⁶platform/counter for sustainable development in Flanders

Composition	Multi-actor and balanced (at least the steering group)
Functions	<p>Counter/service function:</p> <ul style="list-style-type: none"> • Give solutions to industry for matters concerning sustainable resources, processes and products • Creating partnerships (multi-sectoral) resulting in projects between companies (teaching each other) and between companies and science • Stimulating expertise and innovation: keeping an overview of the available capacities in Flanders, so that companies and scientists know better their place and the direction they must evolve to. This way Flemish research can improve and contribute optimally to sustainable development. • Stimulate SME's (commercializing innovative ideas) <p>Depending on means and money become more an O⁶platform:</p> <ul style="list-style-type: none"> • Getting an overview of the complete chemical value chain above the company level: <ul style="list-style-type: none"> - Keep databases up to date - Organize the value chain better by connecting flows • Give education and training • Stimulate open collaborations (e.g. plants and installations) • Sensitize society and legislative bodies • Demonstrating the added value of the Flemish chemical industry and benchmark internationally • Finding and connecting to international initiatives
Applying the criteria of sustainable development (with continuous optimization of the criteria)	<ul style="list-style-type: none"> • Steering and assessing projects started in the 3 domains of FISCH: making the most sustainable choices • Measurement systems for sustainable development <ul style="list-style-type: none"> - Technical measurements (processes) - Expanding LCA (from resource to product, covering the 3 domains of FISCH) to a complete sustainability assessment system of the chemical value chain - GRI indicators can be used as a starting point • Cost-benefit analysis to estimate the profitability of projects

Table 3: Focuses of the 3 subgroups for the potential O⁶platform/counter for sustainable development in Flanders

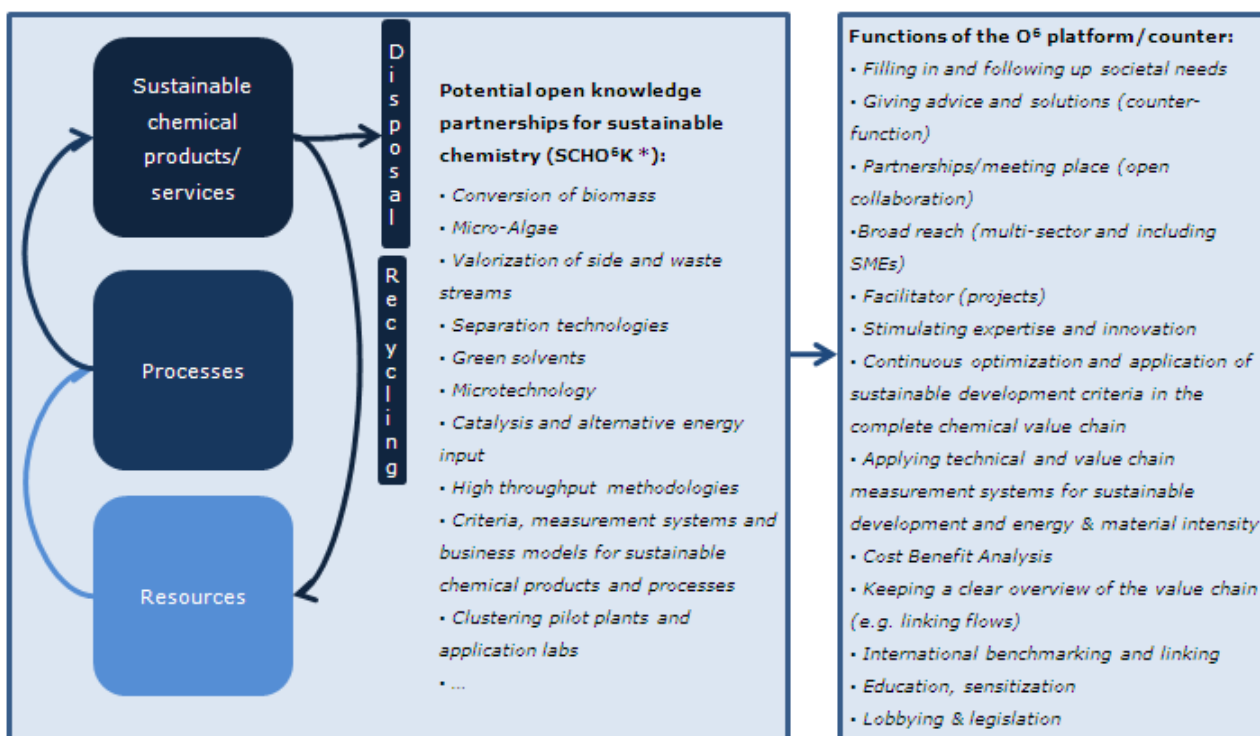
	Industry	Essenscia	Non industrial
Composition	Essenscia, universities and VITO	Objective O ⁶ Linking with existing initiatives (e.g. related to product safety)	Industry, science, government, NGO's Can be organized in/by essenscia: with a multi-actor steering group, but workers can be from Essenscia Example: board of VMM elected each year
Focuses	Lobbying and reporting government Facilitator Flemish industry Assessment to do's chemical industry Frequency of reporting: every 2-3 years Sensitization/image Laying down OWN standards Motivation: € Tools at disposal (Flanders DC) Reaching SME's (VOKA, UNIZO)	Driven by demand Consultation with stakeholders Meeting legislation Laying down standards Expertise of chemical substances in the value chain + mapping Example: VINYL 2010	Value chain management Filling in and following up societal needs Funding Databases Steering and coordinating development in 3 FISCH domains Education

The O⁶ platform/counter discussed here is comparable, or can be seen as an enlargement of the O⁶ platform that was discussed in the TWG "product effectivity" on 19/02/'09. The goal of the discussed platform in that TWG was more specifically focussed on the sustainable development of chemical products, with accents on designing, recycling, flows, toxicity,... The conclusion of this workshop is that the complete chemical value chain has to be sustainable to come to sustainable products. Resources and processes are only used to make a desired product or to deliver a service. From this point of view one need to think well about the target

and future (incl. use, disposal and processing) of products before they are produced, but also to the path or efforts necessary to make the products (i.e. the resources and processes) that need to be sustainable too. **So the Flemish chemical industry will only be sustainable if the complete value chain is sustainable. The O⁶ platform/counter for sustainable development will have to cover the 3 breakthrough domains of FISCH and keep them together, because they can't be seen apart from each other.** In this way it is an enlargement of the platform from the TWG "effective chemical product".

The figure underneath summarizes the results of the discussion on the potential organization of an O⁶ platform/counter for sustainable development in FISCH, covering and coordinating the complete chemical value chain and the potential open knowledge partnerships.

**O⁶ platform/counter:
"Sustainable development of the chemical value chain"**



FISCH breakthrough domains:

Green feedstock
 Building block and energy effective process
 Effective chemical product

* SCHO⁶K: 'Sustainable CHemistry Open Knowledge alliance' with 6 knowledge objectives: 'research', 'development', 'entrepreneurship', 'education', 'training' and 'open'.