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Organisation de Coopération et de Développement Economiques
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**ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND
THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY**

ENV/JM/MONO(2004)28/PART1
Unclassified

Series on Risk Management No. 17

**WORKSHOP ON EXPERIENCES AND PERSPECTIVES OF SERVICE-ORIENTED STRATEGIES IN
THE CHEMICALS INDUSTRY AND RELATED AREAS
VIENNA, AUSTRIA, 13-14 NOVEMBER 2003
PART I: SUMMARY AND CONCLUSIONS**

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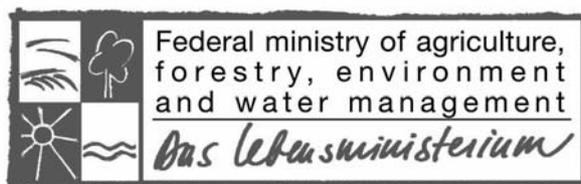
English - Or. English

OECD Environment, Health and Safety Publications

Series on Risk Management

No. 17

STRATEGIES IN THE CHEMICALS
INDUSTRY AND RELATED AREAS
VIENNA, AUSTRIA
13-14 NOVEMBER 2003
PART I: SUMMARY AND
CONCLUSIONS



IOMC

**INTER-ORGANIZATION PROGRAMME FOR THE
SOUND MANAGEMENT OF CHEMICALS**

A cooperative agreement among
UNEP, ILO, FAO, WHO, UNIDO, UNITAR and OECD

Environment Directorate
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
Paris 2004

**Other Environment, Health and Safety publications related
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Risk Reduction Monograph No. 1: Lead. Background and National Experience with Reducing Risk (1993)

Risk Reduction Monograph No. 2: Methylene Chloride. Background and National Experience with Reducing Risk (1994)

Risk Reduction Monograph No. 3: Selected Brominated Flame Retardants. Background and National Experience with Reducing Risk (1994)

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Risk Management Series No. 10: Proceedings of the OECD Workshop on Sustainable Chemistry, Venice, 15-17 October 1998 (1999)

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The Environment, Health and Safety Division publishes free-of-charge documents in nine different series: **Testing and Assessment; Good Laboratory Practice and Compliance Monitoring; Pesticides and Biocides; Risk Management; Harmonisation of Regulatory Oversight in Biotechnology; Safety of Novel Foods and Feeds; Chemical Accidents; Pollutant Release and Transfer Registers; and Emission Scenario Documents.** More information about the Environment, Health and Safety Programme and EHS publications is available on the OECD's World Wide Web site (<http://www.oecd.org/ehs/>).

This publication was produced within the framework of the Inter-Organisation Programme for the Sound Management of Chemicals (IOMC).

The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) was established in 1995 following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. The participating organisations are FAO, ILO, OECD, UNEP, UNIDO, UNITAR and WHO. The World Bank and UNDP are observers. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organisations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

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OECD WORKSHOP SUMMARY

"EXPERIENCES AND PERSPECTIVES OF SERVICE-ORIENTED STRATEGIES IN THE CHEMICALS INDUSTRY AND RELATED AREAS"

Vienna, 13/14 November 2003

**FEDERAL MINISTRY OF AGRICULTURE, FORESTRY, ENVIRONMENT AND WATER
MANAGEMENT**

INTRODUCTION

Chemical products provide a broad variety of services such as “cleaning”, “coating”, “colouring”, “greasing” among countless others. Nevertheless, the focus of economic interests and marketing strategies of chemical businesses is mostly on products rather than on services, which inevitably implies that the economic success is directly linked to the product turnover. Shifting the focus more toward the “service-part” by using models such as "Chemicals Leasing" could contribute significantly to enhancing the eco-efficiency with regard to the use of specific industrial chemicals. The OECD Environmental Outlook for the Chemicals Industry, Section 5.5, points out that “The movement toward a more service-oriented economy has implications for better preventing pollution along the entire life cycle of a product. Companies (both suppliers and customers) are focusing more on the function a product can provide than on the product itself in order to find better and cheaper ways of achieving business goals.” Therefore, as many countries showed interest in this topic, it seemed appropriate to hold a Workshop in order to exchange information and experience and to consider possible ways forward.

THE AUSTRIAN BACKGROUND

The Workshop held on the 13th and 14th November, 2003 in Vienna, was stimulated by an Austrian initiative around the "Chemical Leasing" business models. Especially the studies and publications commissioned by the Austrian Environment Ministry were a starting point for further activities in this field. The studies showed that almost 4,000 Austrian companies would basically qualify for the application of such models, cutting today's annual use of 150,000 tons of chemicals by one third. This corresponds to chemical substances of around 50,000 tons per year that would not have to be used nor paid for and, hence, would not result in emissions nor waste. This reduction would be distributed to the individual environmental media as follows: 10% emissions to air, 15% emissions to water and 75% waste. On average, the user of these new business models can expect cost savings of up to 15%.

AIM OF THE WORKSHOP

The focus of the Workshop was to show the various attempts to implement service-oriented strategies such as "Chemical Leasing" models in practice. Moreover the possible economic and environmental benefits as well as the possible obstacles and drawbacks should be elucidated. The conclusions were to give an assessment of the prospects of future development for such business models.

FACTS

Around 100 participants from 16 countries attended the Workshop. Experts from the USA, Sweden, UK and Germany presented their experience with this business model. ⁽¹⁾ Some experiences from Japan were also introduced. A broad overview of examples gave an impression of company-specific experience. Special emphasis was given to legal as well as political aspects in particular with a view to the new EU Chemicals Policy.

OECD WORKSHOP STEERING GROUP CONCLUSIONS

The Workshop underlined the promising perspective for these emerging new business models. It turned out that there are many very different kinds of service-oriented approaches already in practice. They range from simple service-like attributes added to chemicals within marketing strategies up to total outsourcing of some steps of the production processes. All the models shown had in common that the potential benefit concerning the reduction of chemicals use is indisputable. So far, the idea has been promoted more in USA than in Europe.

Structure of the Service-Oriented Business Models

The various examples presented for service-based business models can be structured according to their degree of integration: At the basis there are cases where the purchase of chemicals might simply be outsourced to a specialised company validating and judging the various offers and products on the market. In this case reasonable cost savings might be achieved. Increases in efficiency of chemicals' use, however, need an integration of the monitoring and evaluation of processes and technologies to be involved into the business model.

Forms of cooperation with an even higher degree of integration, "Chemical Leasing" solutions, challenge the ownership of the chemicals as element of the business and tend to base the business on a functional unit, thus switching from a product-oriented business model to a service oriented one – also with regard to the chemicals' functions. At the top of the pyramid are joint ventures founded by the producer of the chemicals and the user, performing the job on a service – unit basis. This business model is spreading quickly in special sectors, and strong growth in all sectors is expected

Benefits from the implementation of Service-Oriented Strategies

Many of the varieties of models were presented during the conference, each of them showing remarkable results with regard to cost savings as well as ecological improvement – via reduction of chemicals use, as well as via optimisation in terms of exposure and use efficiency.

The Workshop demonstrated that the promotion of recycling rather than disposal and the minimization of pollution caused by waste disposal are positive aspects connected with these business models. In general, closing material flows is an inherent goal within chemical leasing concepts. For this purpose it seems appropriate to include recycling companies as partners.

Chemical leasing gives the chance as a strategic tool to find new partners, new clients, and to open new markets. The chemical industry is a fast-developing industry with constantly changing processes and new chemicals being introduced to the market. It seems interesting for all partners involved to seize the opportunities to develop new chemicals, technologies, products and business

concepts - to optimise processes, continuously reducing chemical lifecycle costs and risk. On that basis, it can be concluded that the interactive and simultaneous development of chemical products as well as application technologies is the main and the most innovative element of service-oriented business models.

Conditions and recommendations for successfully implementing Service-Oriented Strategies

Among possible obstacles is the loss of knowledge and loss of control over the processes: the customers are skeptical about the providers' competence in managing customers' processes. Also, the lack of understanding of life cycle costs of chemical management is a preventing factor.

In order for a company to shift to a service-based business model, a business partner is required to provide know-how not only with regard to the products' market but also concerning the specific applications and uses of chemicals within the company. In all examples, the vital necessity for permanent and accurate quality control regarding the composition and condition of the chemical product ("fitness for use") was shown. Tools providing this monitoring function are to be combined with measures ensuring the necessary substitution or adaptation.

The Workshop showed that among the many conditions and influences that will serve to facilitate or impede the development of these new business models, the legal framework within the partners in these business arrangements will cooperate, is crucial. A well-based and transparent legal framework embedding these new business models is essential to overcome possible reservations. The Workshop highlighted the need of case-specific clarification of responsibilities and an active assessment of the possible shift of competences and expertise between partners. A clear allocation of ownership throughout all stages of the cooperation as well as a transparent and consensual agreement on strict liability for release or disposal was recognized addressed as essential.

As a way through the questions around the legal framework, the possibility of specific legal review of each case of leasing concepts and of similar approaches was mentioned. Major stakeholders have to seek legislative clarification. The legal nature of the chemical within the cycle of the leasing model is decisive. This should become a clear and intelligible factor.

All these new service-oriented chemical business models require a close co-operation between the provider and the user of the chemical. Their successful implementation will be facilitated by policies that would encourage or require this close co-operation, such as the proposed EU Chemicals Policy.

While service-oriented strategies significantly reduce chemical use, there is no built in incentive in the models for substitution of dangerous chemicals. Further work is recommended in this area.

⁽¹⁾ A recent Chemical Management Service Industry Report in the USA documents customer savings of 5%-25% each year over the first five years of such programmes. In a semiconductor facility over a two year period of initiating a chemical service program a reduction in chemical consumption by 50% and in hazardous waste by 8% was achieved. A General Motors assembly plant had a 43% reduction in the number of chemicals used and this resulted in total savings of more than \$750,000 per year. Navistar International's engine plant in Melrose, Illinois instituted a fixed-fee contract with its chemical service provider, reducing its coolant use by more than 50% and its coolant waste by more than 90%.

OECD - CONFERENCE

EXPERIENCES AND PERSPECTIVES OF SERVICE-ORIENTED STRATEGIES IN THE CHEMICALS INDUSTRY AND RELATED AREAS

VIENNA, 13/14 NOVEMBER 2003

AUSTRIAN FEDERAL ECONOMIC CHAMBER

Speaker

Opening - Welcome Addresses:

13 November 2003, 10.00 – 11.00

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Introduction

13 November 2003, 11.00 – 13.00

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Chemicals Leasing – an Austrian Initiative

13 November 2003, 14.00 – 17.00

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14 November 2003, 9.00 – 11.00

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**Thomas Jakl,
Austrian Ministry of Environment**

- Focus on Services

There will always be a need for “Coating”, “Cleaning”, “Greasing” or other chemical treatment of goods-

It is the chemicals’ jobs which are of interest, not primarily the chemicals themselves

- View to Eco Efficiency

These jobs should be performed with as much of the chemical as necessary and as little as possible: In order to achieve a specific service, the flow of materials should be optimised in terms of quality as well as quantity- Target: Optimised use of chemicals while minimising environmental harm

- View to Sustainability - implies shift of paradigm

As long as the economic success of the chemicals industry is strictly dependent on the sale of products, any steps to reduce material flow will hit the very nerve of companies.- A sustainable future strategy for the chemicals industry lies in the implementation of business models, where economic success is dissociated from straightforward sale of products.

Conference Target

- To compile and evaluate the various attempts to implement service-oriented strategies in the chemicals industry and in related areas: from “Product Stewardship” to “Chemical Leasing”.
- Specific experience gained in Austria during the last three years will be shared. (Chemical Leasing, pilot projects)
- Various presentations of leading international experts will allow for an estimation of Economic and environmental benefits
- Possible obstacles and drawbacks will be addressed in order to develop an estimate of future developments and perspectives. Legal and political aspects will play a major role in this context.
- Comprehensive Conference Report shall reflect all inputs, results and recommendations

Austria’s motivation for initiating this Conference-The stimulation of sustainable solutions in chemicals-business is priority area in environmental policy- Government is planning a support concept for service-oriented business models. Conference as benchmarking – forum.

**Laurence Musset,
The Organisation for Economic Co-ordination and Development (OECD)**

A number of OECD activities aim at developing tools and policies for chemicals Risk Management. Examples are activities on Risk Communication, Environmental Taxes and Subsidies, Extended Producer Responsibility, Environmental Labelling, Green Procurement, Harmonization of Classification and Labelling Systems for Chemicals, Sustainable Product Policies and Life Cycle Management, Guidance for SMEs, Sustainable Chemistry and Confidential Business Information.

The objectives of the OECD Chemical Safety Programmes are to assist Member countries to:

- Promote sound management of chemicals world-wide;
- Identify, preventing and reducing risks of chemicals;
- Prevent unnecessary barriers to trade;
- Optimize the use of national resources for chemicals management;
- Integrate economic and chemical safety policies.

Development and revision of chemicals Testing Guidelines, development of Risk Management methodologies, Hazard Assessments of High Production Volume chemicals, working towards Mutual Acceptance of Notification of New Chemicals, information exchange on the Pesticide Registration, Mutual Acceptance of Data and implementation of Good Laboratory Practices, information exchange on Chemicals Accidents and on Pollutant Release and Transfer Registers are important parts of the OECD Chemical Programme.

In November 2002, the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology agreed that Austria would host this workshop. A Steering Committee, comprising Austria, Japan, Korea, Sweden, the United States and BIAC, was established to plan the workshop, which is intended to be a first step towards a better knowledge of where and how chemical management services have been applied and identifying techniques that have worked well.

Obstacles and drawbacks should also be addressed. There were for example recent discussions in the EU regarding biocides applied by “service” companies that also produce the biocides: these biocides escape the regulation due to the fact that they are not placed on the market. In order to avoid such case, the same rules should apply to services companies and to those placing a chemical product on the market.

The main output expected from this Workshop will be a Workshop Report reflecting the presentations and summarizing the discussions. The report should also contain recommendations on how the topic should be dealt with in the future at the OECD level, at Member country level and at the level of individual companies.

Chemical products are used in a wide variety of services such as disinfection, coating and cleaning; however, the focus of economic interest and marketing strategies of chemical business is mostly on products rather than on services. Shifting the focus of management towards “service

part” could contribute to better management of chemical risks. The OECD Environment Outlook for the Chemicals Industry to 2020, which was published in 2001, identifies new approaches for the future, which include the development of a holistic chemical safety approach.

Further developing and extending the concept of the chemicals industry as a “service industry” focuses as one of the strategies which will contribute to a holistic chemical safety approach. “As these chemical “service” companies focus on improving a *function* for their customers rather than a *product*, they have more opportunities to reduce risks at the production, use and waste disposal stage; chemicals users and governments could work together, apply and propagate this concept.”

Service-oriented strategies pointed out the general framework of Integrated Product policy (IPP) and good examples of implementation of such strategies already exist. This Workshop on Experiences and Perspectives Service-oriented Strategies in the Chemicals industry and related areas is part of the OECD work on Chemical Product Policy, an Integrated Product Policy focusing on the environmental impact of products containing chemicals of concern, with expected exposure to man and the environment. Products can be chemicals as such, mixtures or articles.

The aim of the Chemical Product Policy is to prevent injury to human health and damage to the Environment throughout all stages of the product lifecycle, i.e. the production, the use, the storage, the transport, the recycling and the disposal stages. The first of the two weaknesses highlighted in the current systems of chemical risk management is the knowledge of the risks related to mixtures and mostly to articles, when they contain chemicals of concern which may have impact on man or the environment, needs to be further developed. Emission of chemicals from consumer use and service life stages is included in some of the Emission Scenario Documents developed by the OECD Environmental Exposure Task Force.

Another very important problem to tackle is the weakness of the information exchange in the supply chain from the manufacture of a product to its use and final disposal. The chemical producer has the best knowledge of the physicochemical, toxicological and eco-toxicological as well as efficient properties of the chemicals it produces. The user, on the other hand, has the best knowledge of the human and environmental exposure. In order to assess the risks, which includes hazard characterization and exposure evaluation, information needs to be transmitted both ways on the supply chain.

A new OECD activity related to information sharing on chemical products across a chemical product chain has recently started under the lead of Japan. Member countries have been invited to first identify one or more chemicals in either articles or preparations. Hence, they are required to carry out a survey in their own countries on the state of information sharing about potential hazards and risks of these chemical products.

A Service-oriented Strategy is in line with the objective of information exchange across the product chain, insofar as it strengthens the links between the producers and the users. In the cases, that will be presented during this workshop, where there is no change of ownership regarding the chemical (i.e. the producer remains the owner of the chemical also during its use phase), a service-oriented strategy shortens the supply chain. Doing so, it reduces the risk of losing information. Furthermore, the responsibility of the producer, as the actor with control of the product at the production, use and sometimes disposal stage, is much more important.

A Service-oriented strategy can also facilitate implementation of the Extended Producer Responsibility (EPR), a policy approach in which producers accept significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products. OECD has established an activity which aims to provide governments with information on what is needed to establish effective policies and programmes on EPR. From an economical point of view, a service-oriented strategy can provide advantages such as reduced taxes, conservation of working capital and credit preservation.

**Thomas Votta,
The Tellus Institute**

CMS demonstrates a promising Product-Service-System through which sustainability benefits (financial, social and environmental) can be achieved. This presentation will synthesize the US experience, and offer insights into the potential of and barriers to wide deployment of the CMS model. This presentation will also summarize initiatives to research and deploy the CMS model in regions outside the States.

Reduction in the use of chemicals, a key input of production, is beneficial to manufacturers on both environmental and financial grounds. However, traditional business model of chemical industry, which based on the volume and value of chemical sold, provides no incentive for suppliers to pursue chemical reduction. A service-based innovative contracting model – Chemical Management Services (CMS) – restructures the manufacturer-chemical supplier relationship, reliably driving chemical use reduction by rendering service – not volume of chemicals sold – the primary basis of compensation. By decoupling material volume from productivity and sharing the cost savings from improved production efficiency, CMS aligns incentives for chemical users and providers to jointly pursue eco-efficiency. As such, CMS demonstrates a promising Product-Service-System through which sustainability benefits (financial, social and environmental) can be achieved.

CMS is premised on the basis that the real value of a chemical resides in the function it performs, e.g. lubricating, cleaning, and coating, instead of the chemical itself. A service-based compensation structure, therefore, can be established if the supplier can assure that chemical functions are delivered by managing chemical use, handling and disposal in the plant. By linking suppliers' profit with better chemical performance, CMS provides incentives for suppliers to look into opportunities in the entire chemical lifecycle to squeeze waste out and improve efficiency.

The CMS model is consistent with many emerging business management trends: strengthening a company's core functions, outsourcing supporting functions, and building strategic alliances with suppliers. From a sustainability perspective, CMS has demonstrated proven success in helping manufacturers achieve economic and environmental objectives. Under the CMS model, manufacturers can utilize suppliers' expertise in reducing chemical use, improving data/inventory management, and reducing waste generation. These value-added services can help manufacturers to identify opportunities to improve efficiency and reduce resource use and waste. CMS therefore goes beyond "leverage purchasing" and "strategic sourcing" to optimizing operating efficiencies, continuously reducing chemical lifecycle costs and risk, and reducing environmental impacts. A recent CMS Industry Report documents customer savings of **5%-25%** each year over the first five years of such programmes. Examples of environmental and economic benefits from manufacturers that have adopted this model include:

- Over a two year period of initiating a chemical service program, a semiconductor facility saw a reduction in chemical consumption by 50%, and a reduction in hazardous waste by 8%. The facility also has recouped savings of more than \$175,000 a year as a result of other efficiency improvements.

- General Motors (GM) and their chemical suppliers reduced cost, chemical diversity, and associated risks. One GM assembly plant achieved a 43% reduction in the number of chemicals used resulting in total savings of more than \$750,000 a year.
- Navistar International's engine plant in Melrose, Illinois instituted a fixed-fee contract with its chemical service provider, reducing its coolant use by more than 50% and its coolant waste by more than 90%.

On the supply side, with the offering of sustainable chemical services, CMS providers can establish competitive advantage by differentiating themselves from competitors. Provision of CMS services can also help CMS providers to establish long-term strategic relationship with customers (secure customer accounts), and expand revenue base through diversified services.

The CMS model is gaining ground in the US, with high penetration (50-80%) in the US automobile sector, and is emerging in other chemical intensive manufacturing sectors, including electronics and aerospace manufacturing. Successes of the model in US have drawn growing interest from Europe and Asia. Sponsored by the Korean government, a project has recently launched to test CMS in the market place and establish long term capacity to promote this "servisizing" model in Korea.

With funding from the Pew Charitable Trusts, the Heinz Endowments, and the US EPA, the author has been heavily involved in CMS program development—including chemical costs baselining, RFP development, proposal evaluation and implementation tracking—with a set of manufacturers from various sectors in the US. The author also leads the effort to advance this model in Europe and Asia. This presentation synthesizes the US experience, and offers insight into the potential of and barriers to wide deployment of the CMS model. This presentation also summarizes initiatives to research and deploy the CMS model in regions outside the States. Success of the CMS model relies on a mutual understanding of *total* chemical costs. Appropriate compensation mechanisms are critical to achieving chemical use reduction.

Product Service Systems (PSS)

"A marketable set of products and services capable of jointly fulfilling a user's 'need'"
(*Policy Document on Environment and Economy, Government of the Netherlands*)

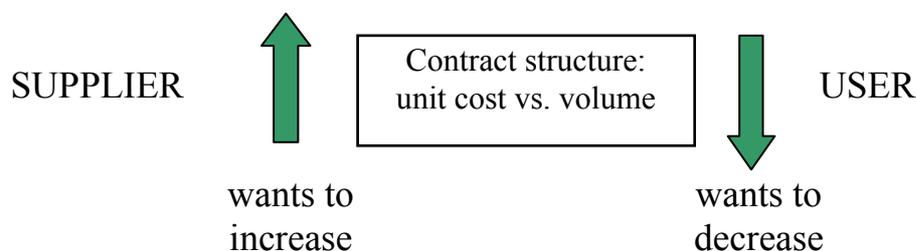
- "Marketable" means the business case exists- Market acceptance, technical feasibility, etc.
- "Set" means that the *combination* of product and service creates value-added
- Focus is on the function of products
- In PSS, services are *beyond* the minimum services required for distribution of the product
- See <www.suspronet.org> for a guide to research

Chemicals: Essential but Problematic

- Society has a clear interest in:
 - Reducing total use of chemicals
 - Assuring that chemicals are handled and managed in a professional way
- Therefore, chemicals are heavily regulated in all wealthy industrial economies
- BUT regulation is not aligned with economic incentives. . .

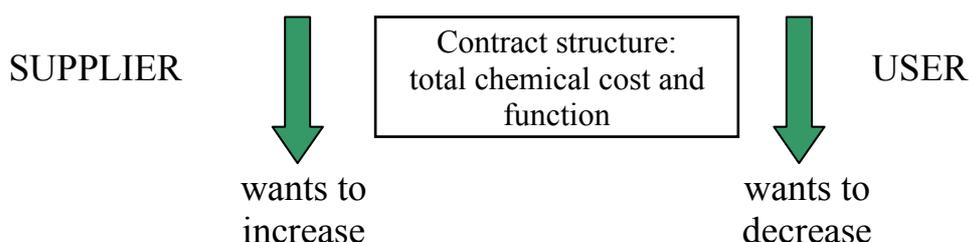
A Key Problem

Basic structure of chemical supply contracts does not create incentives for reduced use of chemicals



The Best Solution: Restructure the Incentives

In theory, contractual incentives can be aligned to promote use reduction



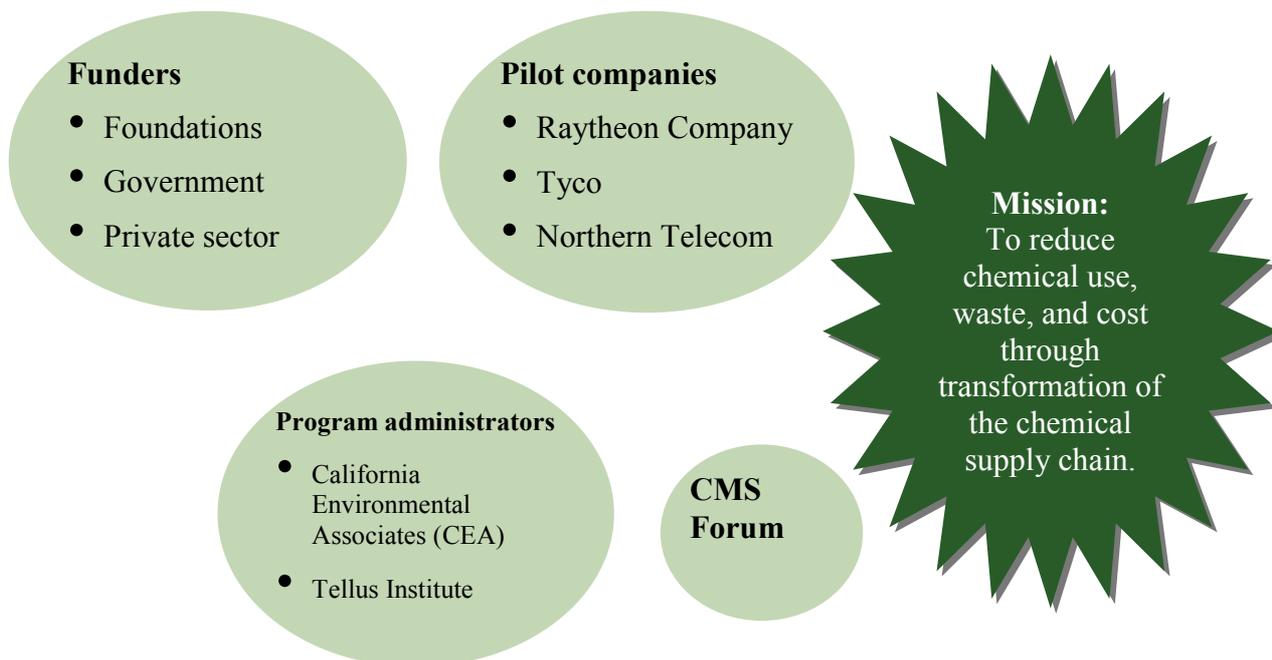
Aligned incentives are the source of potential environmental gains

PSS - From Theory to Practice

Chemical Management Services (CMS)

- A strategic, long-term relationship in which a customer contracts with a service provider to supply and manage the customer's chemicals and related services.
- Provider's compensation is based primarily on quantity and quality of services delivered, not chemical volume.
- CMS is more than invoicing and delivering product. CMS involves optimizing processes, continuously reducing chemical lifecycle costs and risk
- Premise: External CMS companies can perform chemical services more effectively and at a lower cost

The Case of Chemical Management Services



CSP's Activities

- Conduct outreach (publications, case studies, press releases, reports)
- Convene workshops
- Conduct research (pulp& paper, petroleum, pharmaceutical, SMEs,)
- Develop policy initiatives (EPA, State agencies, P2 Roundtables)
- Develop tools and materials (manual, cost models, contract language, RFP templates)
- Provide technical assistance to manufacturing industries
- Promote provider best practices (CMS Forum)

CMS Forum Membership

Haas TCM, Ashland, Air Products, AV Chem, Castrol (BP), Chemico Systems, DaimlerChrysler, Delta, Dow Corning, General Motors, Henkel, PPG, Illinois State, Illinois Waste Management & Research Center, Interface LLC, Raytheon, Rockwood Electronic Materials, Seagate, Shell, Society of Tribologists and Lubrication Engineers, Quaker, United Technologies Corporation

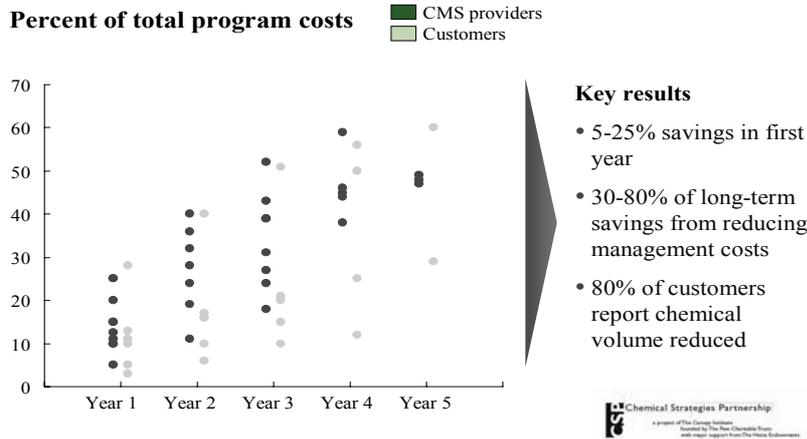
Sectors Using CMS (United States):

- About 10% of the aerospace industry
- About 20% of metalworking industry
- About 35% of the electronics industry
- About 50 - 80% of the auto industry

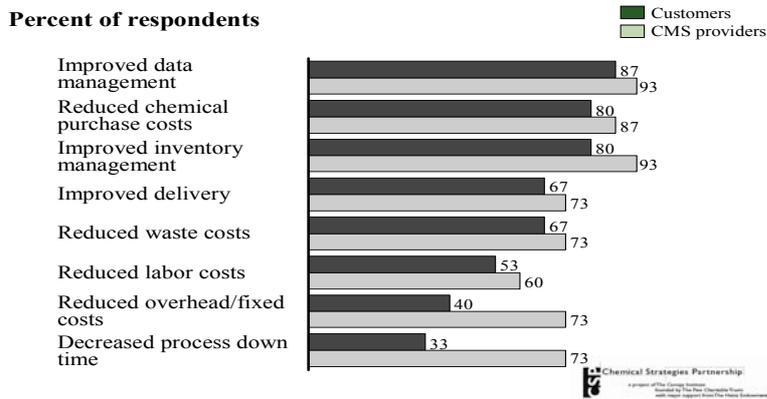
The overall cost savings reported by CMS customers are significant
Key results

- 5-25% savings in first year
- 30-80% of long-term savings from reducing management costs
- 80% of customers report chemical volume reduced

The overall cost savings reported by CMS customers are significant

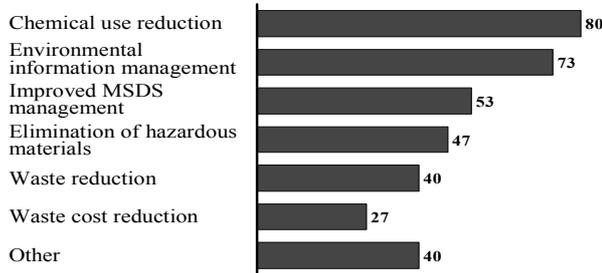


Improved data management is the benefit most widely cited by customers



Environmental benefits are especially strong

Percent of customer respondents



CMS in the field

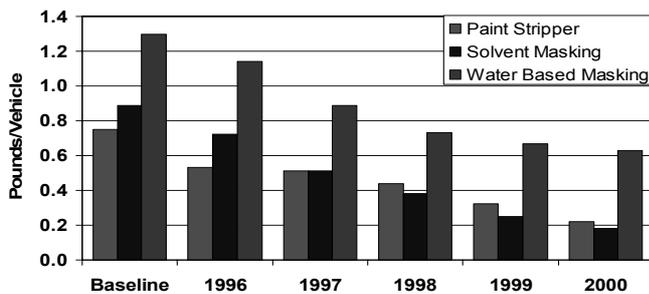
Does the model work?

Collaborations in the field:

- Raytheon, Nortel, AMP
- Seagate Technologies, Analog Data Systems, Stanford Linear Accelerator Center
- Coalition of small metal working firms
- Universities

Case Study: General Motors Oshawa + Haas Corporation

Paint booth maintenance chemicals



Reductions over 6 years in CMS contract with unit pricing:

- 54% decrease in purge solvent
- 77% decrease in paint stripper
- 80% decrease in solvent masking
- 75% decrease in VOC emissions
- 83% reduction in detackification chemicals



Benefits from service contracts: *Semiconductor facility Nortel*

Results from first 3 years of CMS program

- ↓ On-site chemical inventory by 50 %
- ↓ 50% of annual chemical consumption in 2 years

- ↓ 8% of hazardous waste in 2 years resulting in savings of \$24,000/year
- Substituted several chemicals resulting in savings of \$120,000/year
- Changed chemical container size resulting in savings of \$55,000/year

CMS: Institutionalizing Change

- Replicates best practices within and across industrial sectors
- Spurs innovation and continuous improvements
 - Expertise and R&D (not tied to a particular product)
 - Process level expertise to achieve chemical use efficiency
- Closes industrial loops
 - Systems are viewed through lifecycle responsibilities
 - Creates linkages across sectors (e.g., defense sector and expired material)
- Provides data, data, data
 - Chemical clearance, regulatory reporting, MSDS, tracking to point of use
 - Critical component of ISO 14001 for companies who adopt CMS

Key barriers & CSP responses or...

Why Aren't More Companies Doing It?

Barriers

- Chemicals are a small percentage of overall operating costs
- High perceived transaction costs
- Lack of management support
- Supplier limitations
- Lack of credible information

CSP Response

- Makes true costs transparent
CSP Manual: Tools for Optimizing Chemical Management
- Lowers actual transaction costs
- Reduces institutional inertia
- Strengthen supplier base
CMS Forum: membership group
- Disseminate credible information

CMS: Government Role

*While market based, CMS is not automatic. CMS, like any **innovation**, will require demand and supply side activities*

- Demand Activities
 - Research
 - Education/outreach
 - Demonstrate the model on the ground
 - Provide tools to chemical users (estimate lifecycle costs; develop request for proposals; design incentives)
- Supply side challenges
 - Competitive CMS provider market
 - Reduced use not aligned with chemical manufacturers profits
 - CMS providers lack (initial) credibility with potential customers

Ongoing International Initiatives

- Establish the model overseas
- Many customers/suppliers operate internationally

- Little activity overseas
- Large opportunity for expanding economies

- Europe

- Interest from many EU countries
- Some initial work in the UK but expand to larger EU
- CSP transfer of knowledge to EU organizations (FP6)

- Asia

- Singapore workshop in July 2002
- Pilot project in Korea and potential capacity building
- Workshop in February 2004 in Singapore

Conclusions

- CMS is growing
- Exemplary of where supply chain restructuring is headed in many business sectors-
services and information

**Oksana Mont,
Lund University**

Learning from Experiences: Chemical Management Services in Scandinavia (Sweden)

Chemical management services are a relatively new concept for many Scandinavian companies that use chemicals in their processes and applications. Procedures of chemicals on the other hand are more familiar with it. The essence of the concept is to sell services of chemicals rather than chemicals per se. Existing practical applications of the concept stretch from provision of services together with selling chemicals towards provision of system solutions, in which a chemical provider takes over the management of chemicals in customer's processes at the customer's site.

So far, the idea has been promoted more in USA than in Europe. The on-going research at the International Institute for Industrial Environmental Economics at Lund University aims to contribute to understanding of the current situation with CMS in Scandinavian countries, primarily in Sweden and to identify strengths, weaknesses, opportunities and threats for CMS dissemination in Nordic countries. The research is mainly conducted through telephone and personal interviews with companies and relevant stakeholders. Information is also being collected through questionnaires to companies that provide CMS, to customers of CMS, and to companies that are considering provision or purchase of CMS. The goal of this presentation is to provide an overview of existing opportunities and barriers for CMS providers and customers in the Scandinavian context and highlight important lessons regarding CMS shaping in these markets.

INTRODUCTION

The chemical industry is very diverse. Every year hundred of new chemicals are being developed and introduced to the market. Often we do not know what consequences to our health or the environment these chemicals might lead to. Chemicals are released to the environment during all stages of their life cycle. A study of the Swedish National Chemicals Inspectorate (KemI) reports that for four of the five substances studied, the majority of emissions occurred during the service life of the product (Royal Commission on Environmental Pollution 2003). End-of-life stage of many chemicals may create significant environmental impacts when chemical substances are stored in a landfill or burned. Chemicals do not only affect the environment, but human health as well.

One way of dealing with chemicals-related impacts is to reduce the number, volumes and toxicity of chemicals used in numerous applications in industry and in the society – something what the concept of chemical management services (CMS) strives for. The essence of the concept is to sell services of chemicals rather than chemicals per se. Existing practical applications of the concept stretch from provision of services together with selling chemicals towards provision of

system solutions, in which chemical providers take over the management of chemicals in customers' processes at the customers' sites (Reiskin, White et al. 1999). Chemical management services are a relatively new concept for many Scandinavian companies, who use chemicals in their processes and applications. Producers of chemicals on the other hand are more familiar with the CMS as a system solution (Singhal 2003).

The on-going research at the International Institute for Industrial Environmental Economics at Lund University aims to contribute to understanding of the current situation with CMS in Scandinavian countries, primarily in Sweden, and to identify strengths, weaknesses, opportunities and threats for CMS dissemination in this region. The goal of this presentation is to provide an overview of existing opportunities and barriers for CMS providers and customers in the Scandinavian context and highlight important lessons regarding CMS shaping in these markets.

SWEDISH CHEMICAL INDUSTRY AND CMS

Market situation for chemicals and CMS

The Swedish chemical industry is to a large extent owned by non-Swedish companies as a consequence of the globalisation and industry restructuring. There is usually one main manufacturer of each high volume chemical in Sweden (The Swedish Plastics & Chemicals Federation 2003). Chemical companies are characterised by high environmental awareness and commitment to environmental improvement. The Responsible Care programme was introduced in Sweden already in 1991.

Chemical management services have been on the Nordic market for more than 10 years. They are more known to companies and authorities as strategies for chemical outsourcing. The extent of CMS differs in different sectors. It is mostly big international chemical companies, who provide CMS in Nordic countries. However, CMS, being a relatively novel activity for Nordic companies several years ago, becomes more common among local producers. New players are looking for possibilities to enter CMS market, although the majority of CMS providers are still international. Looking at the customers' side, as the manufacturing industry struggles with diminishing margins, having a differentiated service offer and reduced costs for handling chemicals through CMS helps to stay competitive. On the other hand, companies who have invested into development of the in-house chemical management system do not perceive externally managed chemicals as a competitive advantage.

CMS providers' story

For CMS providers, CMS is a business idea that provides new market for their products and services.

The benefits of CMS for providers might be realised through financial benefits and due to the maintaining or growth in the businesses. Cooperation with other chemical mgt providers and chemical suppliers is also mentioned as a benefit.

The benefits for customers as perceived by providers are the possibility to manage chemicals with just 1 provider, who makes expert choices; by reducing the prices for chemicals, by decreasing life cycle costs of chemical management, and by economic gain sharing.

Barriers for the CMS providers or potential providers to enter the CMS market are lack of reference companies with success stories, lack of customer awareness about the CMS concept and about life cycle costs of chemicals, customer reluctance to join CMS due to the fear of losing control over own processes, and lack of support at national and industry association levels.

CMS customer's story

Advantages of CMS for customers are the possibility to outsource chemical management that is not a core business activity and acquire better control and knowledge about chemicals used in the processes from the CMS providers, the opportunity to reduce chemical volumes involved in their processes and consequently chemicals-related costs, and finally the intention of having one system for internal logistics of all products and chemicals.

Barriers for CMS customers or potential customers to employ CMS are the fear of losing internal knowledge about chemicals and control over own processes, lack of CMS providers in specific application areas, fear of mistakes by CMS provider, and possible unwillingness of big suppliers to adapt to specific customer demands. In order to be able to negotiate good conditions and challenging goals for a CMS program, customers need to have a profound knowledge about their chemicals to be able to prevent the opportunistic behaviour of suppliers. Resistance from workers at the manufacturing company who is using CMS is also often named as a barrier to CMS.

Divergent picture of CMS

The main differences in the views of providers and customers are summarised in the table below.

Table 1 Divergent view about CMS

N	Issue	Providers' viewpoint	Customers' viewpoint
1.	Perceptions about the CMS market	Market is immature and underdeveloped	Providers are not providing services of high value
2.	Information about CMS on the market	Very few customers know about CMS	Lack of information about CMS and CMS providers
3.	Lack of total CMS	Dominant culture of control over own	Many CMS providers do not have necessary specialists and other

		production - customers do not allow providers to deliver total CMS	capabilities to run the total CMS.
4.	Information provision about chemicals management costs	Better chemical management by tracing all the costs	Hard to get full costs from CMS providers, especially broken down to each production machine
5.	If CMS is not satisfactory	Easy to change the provider	Lack of CMS providers for specific application areas
6.	Lack of environmental commitment	By governments, industry organisations and manufacturing companies	By providers

1. Perceptions about the CMS market

There are elements of the CMS provided to many sectors of industry. Examples of “truly” systematic and all-embracing CMS, however, are rare. Explanations of this phenomenon differ between the providers and customers of CMS. While the providers explain it by the “immaturity of the Scandinavian market”, lacking awareness and dominant culture of control over own production, the customers tend to refer to the insufficient service of the providers and problems with deep integration of the chemical service providers into the customers operations.

2. Information about CMS on the market

The providers perceive that very few customers know about CMS. The customers point out that indeed there is very little information about what CMS are and who the CMS providers are. Outsourcing or adding services to chemicals might be somewhat easier concepts to grasp for the customers, as the majority of companies do not only buy chemicals, but various additional services as well.

3. Lack of total CMS

CMS providers perceive that customers do not allow providers to deliver total CMS due to the dominant culture of control over own production. Some CMS customers stated that many CMS providers do not have necessary knowledge and specialists to run the total CMS. We have also confirmation from few CMS providers that it is a challenging task to manage the entire spectrum of CMS for customers. This is not to say that other companies are very confident in their abilities to provide the total range of CMS.

4. Information provision about chemical management costs

One of the main selling arguments of CMS providers is that CMS allows the customer to get the total picture of life cycle costs. On the other hand, some interviewees-customers indicated that CMS providers failed to submit the data, which were expected to be a natural part of the CMS offer: total price of chemicals purchased, cost break down to departments and cost break down for each process line and even each machine.

5. If CMS is not satisfactory

CMS providers argue that if the chemical management service is not satisfactory it is easy for the customer to change the providers, but it is not easy to win a customer. From the customers' point of view, there are not many providers in each chemical application area.

6. Lack of environmental commitment

CMS providers perceive that governments, industry organisations and customers do not have sufficiently high environmental commitments and this creates a barrier to CMS provision and dissemination. On the other hand, some customers pointed out that some CMS providers did not have as high environmental commitment as the customers themselves. Therefore, they find it difficult to rely upon provider's services in all processes where chemicals are used.

ANALYSIS OF THE CMS SITUATION AND POTENTIAL IN SWEDEN

Strength

Sweden is a small country with a relatively high number of global corporations and large production sites. This creates a potential market for CMS. Norway and Finland do not have as many large companies, who can create a market for CMS, but some individual companies, such as Nokia in Finland, may create the entire market for CMS. As there is a high environmental awareness in Scandinavian countries, environmental improvements resulting from CMS potentially make a good selling argument for CMS.

Weaknesses

A large number of SMEs creates specific conditions and presents particular challenges for CMS dissemination in Scandinavia. It was indicated that CMS is feasible only when a reasonable volume of chemicals is used in the customer's processes.

Volatile industry structure with numerous mergers and acquisitions in Nordic countries do not allow companies to concentrate on considerable changes in their processes and activities.

Opportunities

Chemical industry is a fast developing industry with constantly changing processes and new chemicals being introduced to the market. Many chemical providers are international companies with close ties to European chemical markets. They may have easier access and better negotiating position when sourcing and purchasing chemicals from tier II providers or from their competitors. Knowledge of alternative chemicals is very important when the new EU chemicals directive comes into force as it may lead to the disappearance of some chemicals from the market.

Environmentally sound goals and reported results of CMS provide a rationale for policy involvement in promoting CMS in Scandinavia taking into consideration policy commitments to environmental improvements.

Threats

Environmentally sound alternatives may cost more than other chemicals and thus the CMS goal of reducing chemical management costs does not always ensure that the “best available” and environmentally sound chemicals are being used.

LESSONS AND BOTTLENECKS OF THE PRACTICAL IMPLEMENTATION OF CMS

Lessons regarding CMS as a concept

If CMS is based on pay per unit basis, there is no incentive to change chemicals for better environmental alternatives, which might be more expensive. There might be inconsistency with the Product Choice Principle (previously called the Substitution Principle) that is enforced in Sweden and in Norway (Mont 2001).

According to the existing legislation, CMS customers are liable for chemical use on their sites. CMS transfers the management of chemicals to the CMS providers, while the CMS customers are in the end the ones responsible for the outcome.

Lessons for CMS providers

It is paramount to get the right entrance into the company. When selling CMS, it is important to meet top manager of the company-customer, who can oversee the entire picture objectively, taking into account interests of the entire company, surpassing the interests of separate people or departments.

Lessons for CMS customers

Development phase:

- In order to prevent CMS providers from opportunistic behaviour, the CMS customers could try using 2 providers for the initial evaluation of the processes.
- It is suggested that during the negotiation with CMS providers customers might benefit if they involve professional negotiators. Even more important is to involve legal expertise at the beginning of the negotiation process.
- It is important to define in the CMS contracts what kind of information and in what format should be provided to the customers.

Implementation phase:

- During the implementation phase it is critical to keep the personnel of the customer informed about the changes.

- Many companies pointed out that extra alertness is needed at the beginning of the shift towards CMS when the provider is not fully acquainted with the customer's processes and products.

Follow up:

- Often customers point out that they lack data regarding economic and environmental evaluation of the CMS. In order to avoid this problem, an evaluation system with clear routines should be set up during the initial evaluation before the CMS contract is signed.
- In order to be able to evaluate the results of chemical management services, cost, chemical use and waste targets should be set up early in the process and continuously evaluated and updated.

CONCLUSIONS

CMS providers have been promoting the CMS in Scandinavia since more than 10 years. The CMS scope is rather diverse. Almost any company that uses chemicals does not buy only chemicals, but various chemical-related services. There are cases when CMS provider takes care of the entire chemical management at the customer site. Most successes come from large companies CMS providers who supply CMS to large companies - CMS customers.

SUGGESTIONS FOR FUTURE RESEARCH

A wish list from CMS providers: more information about

- reference companies with success stories why customers are often reluctant to engage with CMS
 - how to deliver the CMS benefits to customers how to standardise the information provision to customers after the implementation
- A wish list from CMS customers*

- An overview of CMS providers in Europe,
- Studies on how to evaluate existing CMS and what indicators to use for measuring CMS benefits,
- Suggestions on how to evaluate the performance of CMS providers,
- Objective view on pros and cons of outsourcing chemical management vs. building internal capacities for managing chemicals.

A wish list from CMS authorities

- More information on CMS is required
- How to secure positive environmental outcomes?
- Database of good examples

A wish list from researchers

- Research on
 - potential pitfalls and unexpected outcomes
 - extent of possible changes for customers
 - reasons for companies to turn down CMS offers
- The issue of SMEs and CMS needs closer attention
- Develop and distribute info about CMS in local languages

**Jennie Oldham
Green Alliance**

Policy drivers and barriers to chemical management services: a UK case study

Green Alliance is a UK-based environmental organisation. It works with senior people in government, business, academia and the environmental movement to encourage new ideas, dialogue and constructive solutions on environmental issues. Green Alliance has recently completed a research project into the potential for the service model to promote resource productivity in the UK. The project focused on two key sectors: chemicals and energy. The findings of this research have been published in a Green Alliance report entitled *Delivering Resource Productivity: the Service Solution*.

The presentation discusses some of the findings of Green Alliance's work in relation to Chemical Management Services (CMS). This business model provides an innovative approach to chemical management, which has been particularly successful in the United States. Interest in the model is growing in the UK and Europe, and at a joint Chemical Strategies Partnership/Green Alliance conference held earlier this year, companies from the auto and aerospace sectors presented their experiences of implementing the model. The economic and environmental benefits experienced by companies, such as Opel at a site in Poland, are impressive.

In the UK, there has been little development of Chemical Management Services to date, and a number of barriers to widespread uptake of this approach can be identified. Primarily, lack of knowledge and understanding of the model is a key obstacle. In addition, users often do not see chemical use as a priority, as chemicals purchase is normally a small proportion of costs. It can be difficult to demonstrate the cost savings involved, as the full lifecycle costs of chemical use are 'hidden' in separate budgets. More widely, the relatively low cost of resources and waste management reduces incentives to adopt a service approach.

There are also cultural barriers to shifting to an approach that requires much more partnership and trust between chemical provider and user. In implementing the model, customer concerns about quality assurance and liability can limit the extent of the service offering. For suppliers, the approach presents a higher business risk, requiring investment in optimisation of processes.

There is a need to create a policy framework that encourages the shift to a service approach. At European level, the proposed chemicals legislation based on the REACH system will increase compliance demands on companies that use chemicals. The proposals also mandate a closer relationship between upstream and downstream actors in the chemical supply chain, to meet the information requirements. The Chemical Management Services approach may help companies to meet these new demands.

Companies implementing CMS in the United States emphasise that the regulatory climate, and a strict liability regime, has been an important driver. Green Alliance recommends that a range of policy instruments and other drivers should be used to stimulate uptake of the CMS model. Fiscal incentives that encourage resource efficiency and avoidance of waste need to be introduced. An increase in waste management costs, for example through an incineration tax, could provide an effective driver for companies to employ innovative strategies to reduce chemical use and

implement process efficiencies such as recycling and reuse. A chemicals charge would increase the cost of raw materials and could be used to encourage substitution of hazardous substances. Tighter legislation on hazardous substances is necessary to encourage companies to look at alternatives, and CMS providers are in a good position to help their customers make substitution decisions.

Government can also play a critical non-regulatory role in sponsoring projects that overcome some of the barriers presented, for example, raising awareness and proving the success of the model in different sectors or countries. Government-sponsored research is needed to highlight the potential of CMS. Running pilot projects is key to demonstrate the benefits of the model in new sectors and disseminate best practice, and companies in the UK feel that government has a role to play in supporting pilot projects. In addition, a government-sponsored chemical audit scheme is a mechanism that could be used to reveal the true costs of chemical use and encourage efficiency. Government should support the establishment of an intermediary organisation such as the Chemical Strategies Partnership in the United States to provide specialist expertise for companies interested in developing a CMS programme. A third-party organisation can help to build trust between supplier and customer, and ensure the model is successfully implemented. In addition, the organisation should act as a catalyst for uptake of CMS, by bringing together suitable CMS providers and customers.

The chemicals industry is the third largest industry in the UK. As such, companies feel that there is a role for UK and European policy to promote the CMS model. Green Alliance will be taking its work in this area forward, to raise awareness of both Chemical Management Services and the service approach more generally, as a mechanism to provide incentives to implement efficiency measures.

Presentation summary

The presentation will provide some background to Green Alliance and our work on the service model, in the context of delivering better resource efficiency. The presentation provides an overview of the UK experience of this model, and the key benefits and barriers to development of Chemical Management Services. The presentation concludes with a discussion of the role that government can play in promoting uptake, and presents key recommendations for moving forwards.

Green Alliance's mission statement is to ensure that the environment is at the heart of decision-making. Although the main audience for our work is government, we also work together with business, academia and other environmental NGOs. Green Alliance has a range of research projects looking at how policy can work more effectively for the environment, and we seek to influence the environmental agenda at a senior level in government. Although the majority of our work is UK-focused, we also work at European level and Green Alliance is the UK coordinator of the European Environmental Bureau.

Over the past year, Green Alliance has been running a project called Service Innovation for Sustainability, looking at the potential for the service model to improve resource productivity in the UK. The work has focused on two key sectors – chemicals and energy – with the aim to raise

awareness of the benefits of shifting from a product to service-based model. The project established a practitioners network for individuals from business, academia and the environment movement to come together and share information and understanding of the service model, through a website, email network and series of seminars.

In February this year, Green Alliance and the Chemical Strategies Partnership came together to hold a major conference on Chemical Management Services in London. The event brought together representatives from companies in the United States and Europe to share their experiences of implementing the service model. We also held a small seminar with chemical companies in the Yorkshire region in the UK, to identify barriers and opportunities to implementing CMS in their businesses. At European level, we've been feeding this work into a research project examining Product-Service-Systems in a range of sectors (www.suspronet.org).

Bringing all this work together, Green Alliance has recently published a report called *Delivering resource productivity: the service solution*, which sets out an agenda for action to encourage further uptake of the service model.

Chemical Management Services: UK situation

So what does the UK experience of Chemical Management Services look like? The chemicals industry is the third largest industry in the UK and is currently under economic pressure so companies are keen to deliver cost savings. So there is a potential market. However, there has been little development of CMS contracts to date – although interest is growing. One of the outcomes of the project is that the UK trade association, the Chemical Industries Association, is now looking into ways in which it can help its members to understand this model and support its uptake.

There are some examples of CMS programmes being implemented in the UK, for example Quaker Chemical Corporation have begun working with Toyota in the UK; and BP Castrol have been working with the aerospace sector on a fluid management system. However, overall it is evident that there is little awareness of the model and understanding of the economic and environmental benefits.

The BP Castrol/Airbus programme is an example of an existing service strategy in the UK, which was presented at the Green Alliance/CSP conference in February 2003. Castrol have implemented a fluid management system at an Airbus site in Filton. The project scope includes: lubrication oil, hydraulic oil, chemicals, waste management and contamination control. The programme provides a strategic partnership involving people, products and processes across the site.

Primarily, the drivers for the programme were that Airbus wanted to reduce costs and manage environmental issues. In 2001, the swarf, or waste material including off cuts, were: 2574 tonnes of aluminium, 74 tonnes of titanium and 196 tonnes of general waste. In addition, there were business risk issues, technical issues such as misting and high waste volumes to be addressed. Castrol has introduced a recycling and process optimisation programme. The financial benefits of the programme amounted to £185,000/year. High coolant usage and high waste volumes were addressed, resulting in better risk control and EHS improvements. In addition, a 50 per cent

reduction in swarf volume has been achieved. Benefits from other action taken include downtime reduction, waste reduction and best practice transfer.

The BP Castrol/Airbus presentation outlined a number of lessons for companies entering into similar projects. Partnership is key to the programme's success – from scope design to development and implementation, through the running and review of the programme. In addition, the need for clarity of common objectives and openness of information will help to ensure success. The companies also identified the need for benchmarking and measures, and effective change management. Overall, it was felt that a key challenge to overcome is the need to recognise that benefits go beyond the product price.

Economic benefits

The basis of the financial model for CMS is that procurement of chemicals only accounts for a fraction of the true costs of chemical use to a manufacturing facility. Lower costs for users result from optimisation of processes. Companies have experienced a range of economic benefits including: reduced chemical purchase, waste and labour costs; reduced overhead costs; decrease in process down-time; improved inventory and delivery; and – a factor that is likely to become increasingly important in Europe – improved data management. For suppliers, there are opportunities for differentiation from competitors due to their ability to offer sustainable chemical services.

Environmental benefits

Changing the supplier compensation model provides the opportunity for environmental gains. Thus Chemical Management Services presents a win-win for profits and the environment. Most significantly, CMS results in a reduction in chemical use and waste reduction, improving resource efficiency. Other benefits include the potential to eliminate hazardous materials. The ability for service providers to introduce innovative process elements using clean technologies can create significant environmental benefits, and is often based on recycling and reuse of material that previously entered the waste stream, such as in the BP Castrol example.

In the UK, the environment has come up the agenda as a business issue, as more and more companies are reporting on their environmental and social performance, and changes to pensions regulation has created more pressure to disclose information. In this context, companies can see the benefit of CMS as part of ISO14001 accreditation and to provide data to report on performance.

An advanced CMS programme in Europe is PPG Industries' programme at a greenfield automotive site in Poland [this case study was presented at the Green Alliance/CSP conference]. PPG's service offering includes process management, inventory management, chemical management, training and safety. PPG see CMS as a process and chemical management programme, that relinquishes the need of the customer – in this case Opel – to deal with sub-suppliers (referred to as Tier II suppliers) as these are dealt with by the business partner – i.e. PPG.

At the car plant in Poland, PPG is fully integrated in Opel's processes, with a large team of personnel working on site. The main focus of the process management programme is the paint shop, where PPG's responsibilities cover cleaning, process control, process engineering, production and laboratory. Whereas some CMS programmes at auto plants only cover indirect chemicals, here PPG also has responsibility for direct chemicals used on product vehicles – in other words, the product that goes out of the factory door.

Benefits have been achieved by changing processes and introducing new materials, with the result that 'right first time' in the paint shop has increased from 50 – 95 per cent, with a material usage reduction, or resource efficiency of 30 per cent. Environmental achievements have included reducing chloride concentration in waste water by 70 per cent, and reducing waste water sludge. The economic benefits have been significant, resulting in cost savings to the customer of 10,000 Euro/month. Other business benefits have included PPG's ability to bring hazardous materials expertise and knowledge of local legislation. In summary, the programme has resulted in significant cost reduction and process optimisation.

Barriers

So if Chemical Management Services can deliver all the benefits presented, why isn't the model more widely used? Green Alliance has identified a number of key barriers to uptake:

1. Cultural barriers should not be underestimated. As one company said, the mindset of both customer and supplier has to change. There can be considerable resistance to adopting an unfamiliar business model. Lack of understanding and credible information on the CMS model is a key barrier for customers.
2. Poor cost awareness of current chemical management practices is a key barrier. The additional costs of chemical lifecycle functions – such as procurement, inventory, delivery, monitoring, reporting and disposal are often budgets spread across different business units. Helping a company to understand these full costs represents a huge challenge. In addition, users may not see chemical use as a priority, and a lack of cost awareness compounds problems of inertia and makes it difficult to demonstrate the benefits to senior management.
3. Concerns about quality, control and liability can limit the extent of the service offering – perhaps just to indirect chemicals such as cleaning.
4. For suppliers interested in offering Chemical Management Services, the model presents a higher business risk, requiring investment in optimisation of processes.
5. Externally, the regulatory regime in Europe has obstructed further uptake. In the UK, there are some barriers around waste definitions. For example, leasing solvents is very difficult as it presents difficulties in setting up reuse/recycling. The UK Environment Agency is looking into this.

6. Underlying some of these barriers is the relatively low costs of raw materials and waste management, which provides little incentive for companies to think strategically about their use of resources.

There are solutions to these obstacles, and in the United States the Chemical Strategies Partnership has played an instrumental role in helping companies to overcome these barriers. A recurrent theme from the conference we held on CMS was the importance of partnership, mediated through an independent third party organisation. In this way, education and awareness-raising can increase knowledge of the model, and bring together suitable CMS providers and customers. Partnership is also required to ensure the programme meets both parties' needs – as BP Castrol and Airbus highlighted from their experience. In addition, tools are required to make the true costs of chemicals apparent.

Policy drivers

There is a critical non-regulatory role for government, in sponsoring projects that overcome some of the barriers presented. Companies in the UK feel that government should support pilot projects to demonstrate the benefits of the model and success in different sectors/countries. Pilot projects should be used to disseminate best practice. In addition, there is potential for a government-sponsored chemical audit scheme, which would focus on use and promotion of existing audit tools to reveal full costs of chemical use. Part of the issue is that companies do not understand how to put the model into practice. We feel that there is a role for government in supporting the establishment of an intermediary organisation to act as a catalyst for uptake and provide specialist expertise for companies interested in developing CMS programmes.

Green Alliance also believes that the policy framework can encourage the shift to service strategies. Primarily, economic instruments are required to internalise environmental costs into the price of resources. An increase in waste management costs, for example by introducing an incineration tax, could provide an effective driver for companies to employ innovative strategies to reduce chemical use and implement process efficiencies. The Royal Commission on Environmental Pollution, which advises the UK government on environmental issues, has recommended the introduction of a chemicals charge to increase the cost of chemicals – but particularly chemicals of concern, to encourage substitution of hazardous substances. Control of hazardous substances through policy can encourage companies to look at alternatives. And CMS providers are in a good position to help their customers make substitution decisions.

The broader regulatory framework is also critical, and I believe that the proposed REACH system presents an opportunity for service innovation. The proposals will increase compliance demands on companies that use chemicals and mandate a closer relationship between upstream and downstream companies in the supply chain, to meet information requirements. The CMS approach could be used to help companies meet these new demands.

Companies implementing Chemical Management Services in the United States emphasise that the regulatory climate, and a strict liability regime, has been an important driver. In the UK, the Environment Agency is moving towards tighter regulation on hazardous substances that could help incentivise companies to take action on chemicals.

Fundamentally, CMS presents the opportunity for increased competitiveness and agility for companies to react to market and regulatory pressure.

Recommendations

In its report, Green Alliance recommends that a range of policy instruments and other drivers should be used to stimulate uptake of CMS:

- A European equivalent of the Chemical Strategies Partnership needs to be set up, in order to raise awareness of the benefits of the model in the UK and Europe, particularly amongst downstream users. The organisation should help to build trust between suppliers and customers and ensure the model is successfully implemented. Pilot projects should be set up to establish best practice information for key sectors.
- Government research to highlight the potential of Chemical Management Services is needed, and we would argue that there is the need for a scoping project similar to the Austrian study to identify the potential of CMS in the UK in strategic terms.
- The potential for a government-financed chemical audit scheme should be assessed. The scheme would develop business materials to publicise tools that reveal the total cost of chemical usage, and assist companies in using them.
- We recommend that the UK Environment Agency should examine legal definitions of waste to ensure that they are not impeding increased reuse or recycling of chemicals.
- And in addition, the wider policy framework for chemicals and waste needs to provide fiscal incentives that encourage resource efficiency and avoidance of waste, as discussed earlier.

In conclusion, Chemical Management Services can contribute to a resource-efficient economy. The benefits of the model are both economic and environmental, and there are existing examples of successful implementation of the model in the UK and Europe. However, we believe that there is a clear role for government in promoting the model and proving the concept in the EU market place. To encourage further uptake in Europe, and the UK, the following is needed:

- A policy framework that supports the service model
- Research and pilot projects to demonstrate the benefits of the model and explore potential in new sectors such as pharmaceuticals
- Information, support and advice to promote the model, particularly with downstream users, and facilitate uptake.

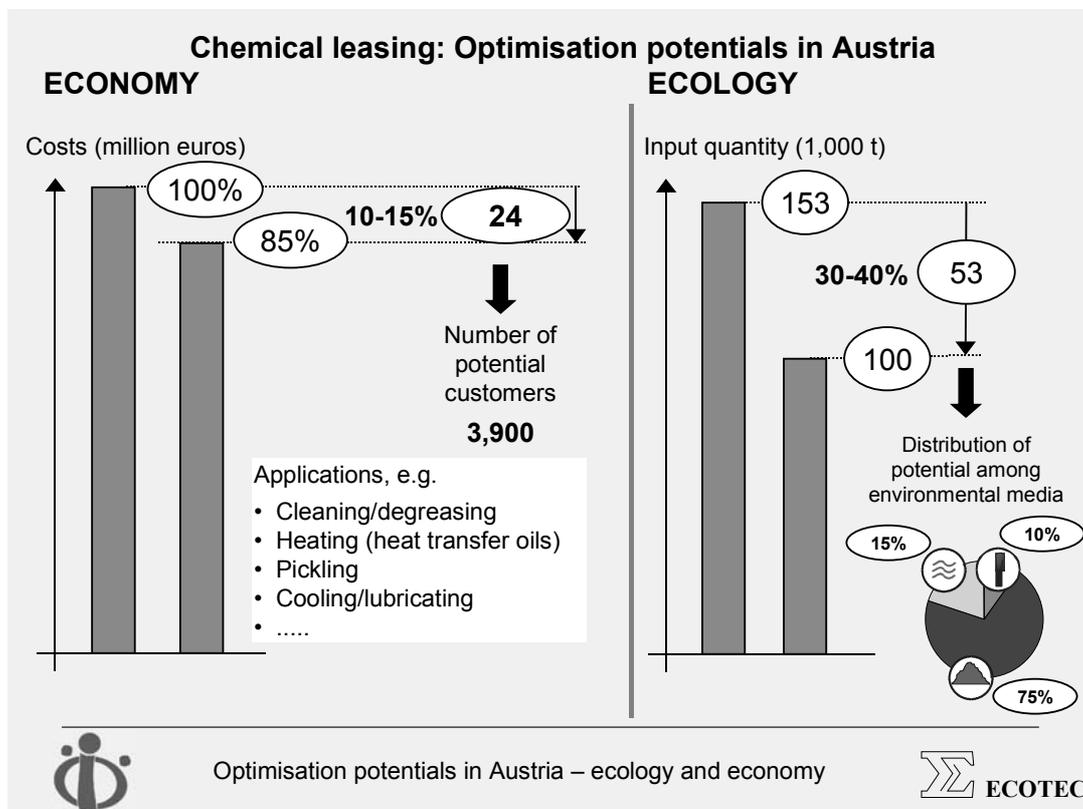
Chemicals Leasing- An Austrian Initiative

Rainer F. Nolte,

ECOTEC, Institute for Research & Consulting Economy- Ecology- Technology

Benefits and Management of Chemical Leasing in Austria - Economy and Ecology-

“Chemical leasing” is a new business model, which generally raises considerable expectations regarding the optimisation of material flow and the achievement of corresponding ecological – and also economical – benefits. Yet these expectations lack any foundation to date. Without this initial evaluation, chemical suppliers and users are not in a position to consider this new business concept as an option. First results are now available for Austria.



A survey carried out by ECOTEC, Munich, and IIÖ, St. Pölten, which was commissioned by the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and a number of companies, provided the yet unavailable information regarding the applications, potentials and lines of action in Austria. It provides answers to the six central questions regarding chemical leasing:

- Which business models are actually suited for chemical leasing?

The **new business model of cooperation** (“**process integration**”) could prevent the prejudices of the traditional business model (“A sells substance C to buyer B”). As a result, production would become more efficient and would thus render products more competitive for the benefit of both parties (“win-win situation”).

Generally, no particular of the **six defined business models** of cooperation (“process integration”) per se is better than any other. The efficiency gains are highest when a division of labour is implemented and each party is doing what it does best (“core competence”).

- Which application/market exists for this in Austria?

In Austria, basic requirements of the business models (e.g. material use in a closed system) are preferably met in the **twelve identified fields of application**, which range from cleaning/degreasing with solvents to heating with oils. This models could be applied in **3,900 companies** using some **153,000 t of materials**.

- How big is the “pie” to be shared in this win-win situation (economical and ecological potentials in Austria)?

The new chemical leasing approach has been expected to yield major ecological benefits and efficiency gains for quite some time, yet their scope has not been specified so far. In view of the overall Austrian market and the relevant applications, the chemical amounts currently in use could be reduced by approximately one third while the scope of activities would remain unchanged. This corresponds to a **reduction of about 53,000 t** of material per year, which would no longer need to be paid for, used and would thus no longer be emitted or disposed of as waste respectively. The highest level of reduction is expected for waste (approx. 75%).

The resulting economic effects of the ecological optimisation potentials are therefore all the more surprising: On average, companies applying the new business model may **expect a cost reduction of 10-15%**, which primarily is a result of the enhanced efficiency.

- On a global scale, what applications and business models are already in use?

On a global scale, the new business models involving chemical leasing are also only **starting out to develop**. Currently, only a few individual pilot projects are known, most of which were implemented in the innovative automobile and electronics industries. In addition, the new business models have been introduced in view of the special hazards chemicals used in production involve and/or due to substantial handling costs.

- What do potential Austrian clients think about chemical leasing (inhibiting and promoting factors)?

Although knowledge of the new business model is of course still slight, informed companies clearly underscore their **positive impression**: almost all of the companies reported a reduction of waste material and a – general – reduction in the use of raw materials. This indicates that expectations were justified and also represents the most important facilitating factor. This is contrasted by inhibiting factors, which may be considered typical for the early phase of implementation: nearly all of the companies deplored the **lack of information and special offers**.

- What can suppliers do to develop this new market?

The ongoing improvement of products and the repositioning of companies is an inevitable and permanent task in the ever more difficult market conditions of today. And there are only three ways to ensure this:

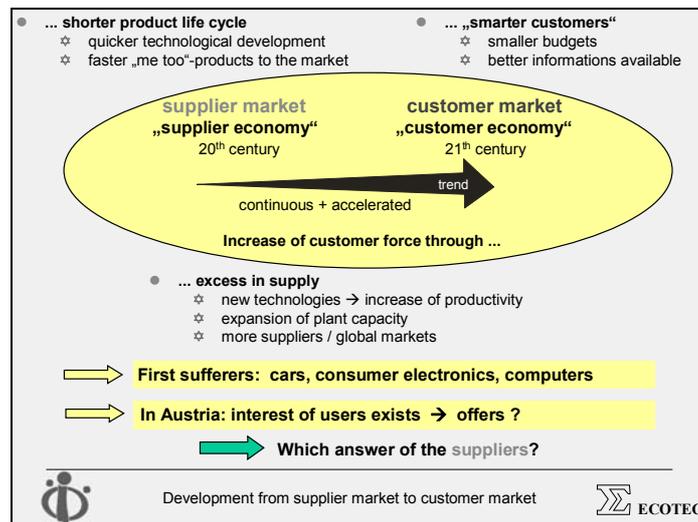
- **Increase production efficiency,**
- **Do what you do best,**
- **Manufacture for the client.**

Each of these approaches is not necessarily new as such. What is new, however, is that these approaches have for the first time been bundled into a comprehensive package – chemical leasing. Austrian companies are in a very unique position since the central questions regarding the achievable optimisation potential and the “who, what, how and whereby” have been answered and taken up.

There is a follow-up project – commissioned by the BMLFUW –, where some interested companies will get support for evaluating/implementing this new business model. For further information please contact ECOTEC.

"Chemical leasing" is a new business model, which generally raises considerable expectations regarding the optimisation of material flow and the achievement of corresponding ecological- and also economical- benefits. Yet these expectations lack any foundation to date. Without this initial evaluation, chemical suppliers and users are not in a position to consider this new business concept as an option. On the other hand markets are developing continuously and accelerated from supplier to customer market asking for new answers like new business models.

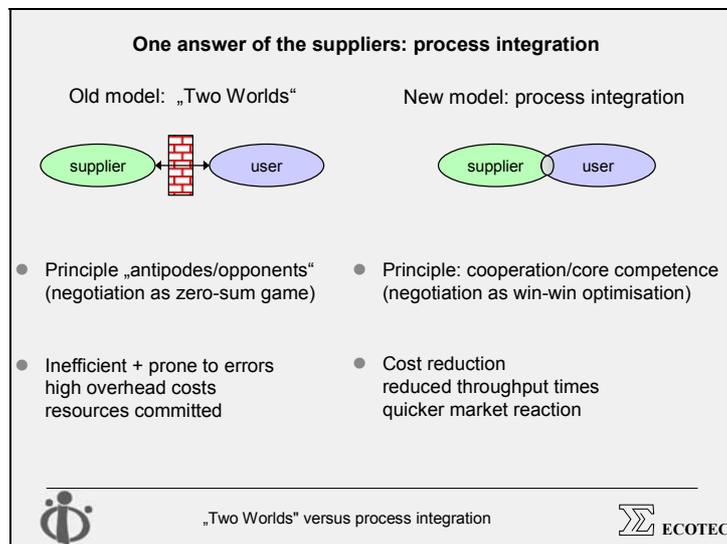
Slide 1



A survey carried out by ECOTEC, Munich, and IIO, St. Pölten, which was commissioned by the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and a number of companies – like DOW, HENKEL, PERO, DAL –, provided the yet unavailable information regarding the applications, potentials and lines of action in Austria. It provides answers to the six central questions regarding chemical leasing:

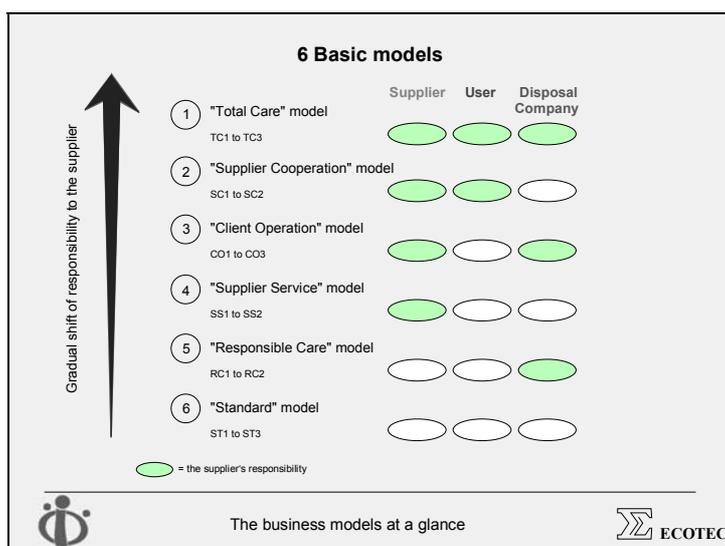
- **Which business models are actually suited for chemical leasing?**
- **Which application/market exists for this in Austria?**
- **On a global scale, what applications and business models are already in use?**
- **How big is the “pie” to be shared in this win-win situation (economical and ecological potentials in Austria)?**
- **What do potential Austrian clients think about chemical leasing (inhibiting and promoting factors)?**
- **What can suppliers do to develop this new market?**

Slide 2



- The traditional business model ("A sells substance C to buyer B ") could be upgraded substantially. Basically, it is characterised by suppliers and users facing each other as antipodes – in spite of all affirmations - playing a **zero-sum game** when negotiating prices, for instance.
 - This business model causes significant double expenditure, it is prone to errors and inefficient in key areas. In effect, it diminishes the competitiveness of products manufactured by suppliers and users for third parties and is inexpedient for both.
- The new business model of cooperation (“process integration”) could prevent these prejudices. As a result, production would become more efficient and would thus render products more competitive for the benefit of both parties (**“win-win situation”**).

Slide 3



Suppliers, users and disposal companies have six basic options of cooperation:

- The **"Standard" model (no. 6)** is the commonly encountered business model. The supplier sells materials to the user and does not take on any additional responsibilities. This way, the user and the disposal company each in their turn become owner and also holder of the materials.
- The first step towards a service-oriented business model has been taken when the material supplier assumes the responsibility of disposing the chemicals after their use. This model is known as the **"Responsible Care" (no. 5) model** and has already been in use for some time in the chemicals industry.
- To progressively expand this scope of services, the material supplier could take on the following responsibilities:
 - The supplier retains the ownership of the material. As it were, the user merely "leases" the chemicals from the supplier (**"Supplier Service"; no. 4**).
 - In the **"Client Operation" model (no. 3)**, the supplier is also responsible for the disposal/recycling of the used material.
 - In the **"Supplier Cooperation" model (no. 2)**, the supplier also operates the user's plant using the furnished materials.
 - And finally, the supplier could take on the responsibility for all services, from delivery to application and disposal/recycling of the materials, which would largely correspond to the **"Total Care" model (no. 1)**.
- The **classification** according to six basic business models allows the categorisation and evaluation of greatly varying practical approaches, the inference of analogies and differences; comparisons and the identification of transferable mechanisms of custom-tailored and detailed models for the individual case.

Slide 4

Groups of materials by fields of application										
Fields of application	HHC	Hydro-carbons-	Acids/bases	activ. carbor	Inorg. subst	Silica sand	Catalysts	Ion exchangers	Aqueous cleaners	Oils/emulsions
> Cleaning/degreasing ● halog. solvents ● non-halog. solv. ● aqueous	(X)	(X)							(X)	
> Adsorption/desorption				(X)						
> Pickling			(X)							
> Casting						(X)				
> Synthesis	(X)	(X)								
> Extraction	(X)	(X)			(X)					
> Cooling/lubricating										(X)
> Textile finishing			(X)							
> Water treatment								(X)		
> Catalysis							(X)			
> Cooling (goods)					(X)					
> Heating (with oils)		(X)								(X)

Groups of materials by fields of application 

- These six basic models thus provided the base for systematising the following results. Generally, no particular business model per se is better than any other. The efficiency gains are highest when a division of labour is implemented and each party is doing what it does best ("**core competence**"). This, however, also greatly depends on where and how the particular materials are used, i.e. in which application it to be applied.
- The benefits of chemical leasing can only be reaped if the use of the chemical fulfils the following basic **requirements of the business model**:

The application of the material must be definable as a service (e.g. cleaning, dissolving, reacting). There is no transfer of ownership; i.e. the material is simply passed on to the user for instance (leasing).

Additional criteria to define applications of this business model that are particularly eligible (chemical leasing in a narrow sense):

- The material is used in a closed system
 - (No application involving a possible release into the environment, e.g. pesticides).
- The material can be returned to the supplier, reprocessed and reused.
 - (The material is only used as part of the operational process and not as a product.)
- In Austria, these criteria are preferably met in the **twelve identified fields of application**, which range from cleaning/degreasing with solvents over pickling with acids to heating with oils. The main groups of materials are hydrocarbons, acids/bases, oils/emulsions and catalysts for example.

Fields of application	Companies	Amounts	
Cleaning/degreasing			Number of * indicates the amounts and companies with an exponential of 10 amounts in t/a, companies in number * < 10 ** < 100 *** < 1,000 **** < 10,000 ***** > 10,000
• halogenated solvents	***	***	
• non-halogenated solvents	***	*****	
• aqueous	****	****	
Adsorption/desorption	***	****	
Pickling	***	*****	
Casting	**	*****	
Synthesis	**	***	
Extraction	**	****	
Cooling/lubricating	***	*****	
Textile finishing - mercerising	**	****	
Water treatment	***	****	
Catalysis	***	*****	
Cooling (goods)	**	***	
Heating (with oils)	**	****	
Total	ca. 3,900	153,000 t	


 Actual situation of material use, semi-quantitative estimation
 

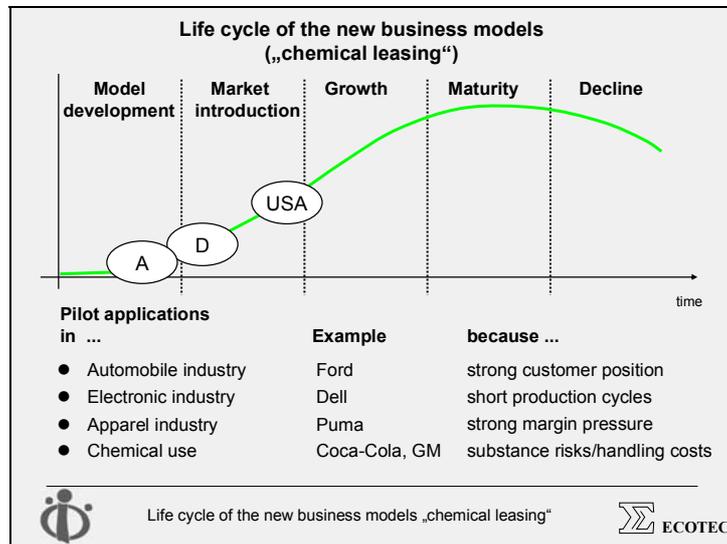
- Based on *resource statistics*[1], *waste amounts*[2] and the information contained in *environmental statements*, it was possible to determine the number of relevant Austrian companies and the amounts of materials used. The overall results indicate a considerable use of chemicals in the twelve identified fields of application in Austria.
- The new chemical leasing business model, in the strict sense, could be applied
 in approx. **3,900 companies**
 using some **153,000 t of chemicals**.

Apart from catalysts and silica sand, oils/emulsions, VOC-related solvents, as well as acids/bases are the most widely used substances in terms of quantity.

[1] Statistik Austria

[2] Waste Management Plan BMLFUW

Slide 6



- On a global scale, the new business models involving chemical leasing are also only **starting out to develop**.
- Currently, only a few individual **pilot projects** are known, most of which were implemented in the innovative automobile and electronics industries. DELL Computers has become the world's market leader within a few years not least because it applied this new concept. In addition, the new business models have been introduced in view of the special hazards chemicals used in production involve (e.g. product contamination in the case of Coca Cola) and/or due to substantial handling costs (e.g. General Motors).

Slide 7

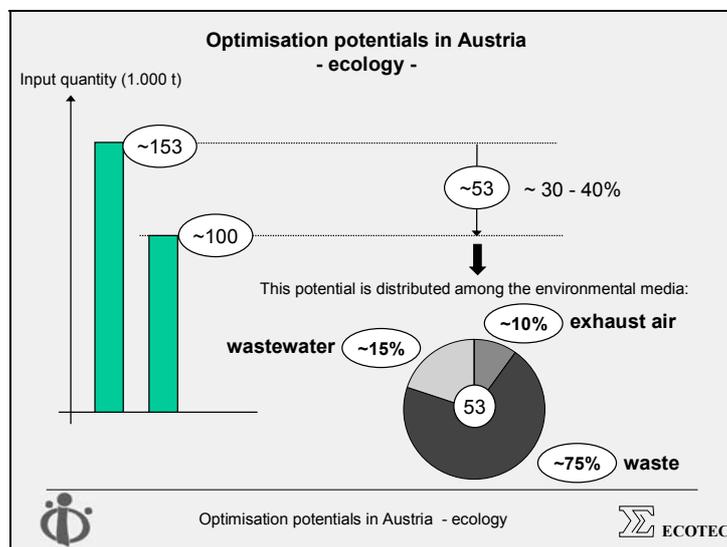
Field of application	Material	Supplier	User	Basic model						
				1	2	3	4	5	6	
Cleaning/degreasing Chemical cleaning	CHC	DOW	various, Europe							
Cleaning/degreasing Chemical cleaning	CHC	Geiss	various, D							
Phosphatising	metal phosphate	Henkel	Ford, USA/B							
Cleaning/degreasing (painting)	aqueous cleaner (paint system)	BASF/ Henkel	DaimlerChrysler, D							
Cleaning (CIP, containers, bottles)	lye, acid	Henkel	beverages industry, D							
Cleaning/degreasing (painting)	aqueous cleaner (paint system)	Eisenmann	VW, E							
Solvent use, gen.	solvent (VOC)	DOW	various, CH				X			
Heating	heat transfer oil	DOW + DAL	DuPont, D		X	X				
Cleaning/degreasing (painting)	aqueous cleaner (paint system)	open	BMW (new plant)		X?	X?				
Chemical use	all chemicals	a major supplier (tier-1)	General Motors, USA							

■ = implemented X = planned

Implemented and planned approaches and allocation to the business models ECOTEC

- The figure shows examples of several **additional fields of application**. The level of development of the chemical leasing models range from basic business model no. 5 ("Responsible Care") in cleaning / degreasing applications all the way to business model no. 1 ("Total Care"), which was implemented at the new VW plant in Spain for the painting of car bodies. Further steps to harness the benefits of this business model are still in planning.
- Overall, this indicates that **implementation is still in its initial stages**. For the few cases where the new business models were applied, only little data on the efficiency gains and thus the ecological-economical potential have been published for understandable competition-related reasons.

Slide 8

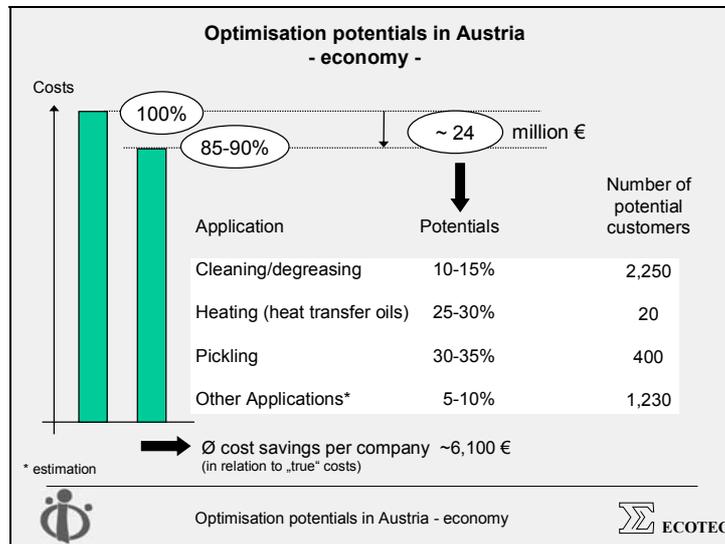


- The new chemical leasing approach has been expected to yield major ecological benefits and efficiency gains for quite some time, yet their scope has not been specified so far.
- A survey comprising 34 companies analysed the actual situation and the development potentials for an optimised service model while assessing the feasibility and educing the potentials for Austria therefrom. Based on the survey results, the following economical and ecological reduction potentials were determined for different business concepts in Austria ranging from service-oriented approaches to chemical leasing.
- In view of the overall Austrian market and then in particular only the companies which were actually able to implement the service-oriented business model, the chemical amounts currently in use could, from an ecological standpoint, be reduced by approximately one third while the scope of activities would remain unchanged. This corresponds to a **reduction of about 53,000 t** of material per year,

which would no longer need to be paid for, used and would thus no longer be emitted or disposed of as waste respectively. The highest level of reduction is expected for waste (approx. 75%).

- The given optimisation potential indicates the **major ecological impact** an implementation of the new chemical leasing approach, in the strict sense, would have in Austria. The high hopes set in the new business concepts have thus turned out to be justified throughout.

Slide 9

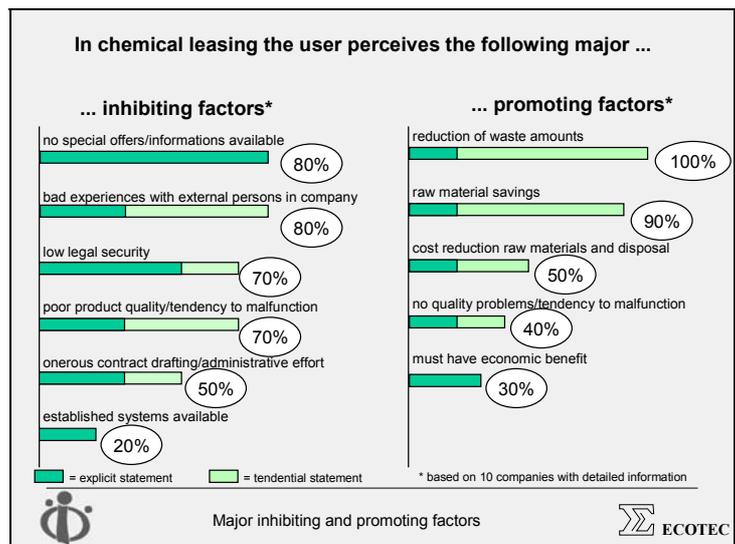


- As is to be expected, however, these substantial improvements can generally not be obtained for free. Particularly in the environmental field, the additional costs for environmental protection have been a key aspect in the long-standing discussion. The resulting economic effects of the ecological optimisation potentials are therefore all the more surprising.
- On average, companies applying the new business model may expect

a cost reduction of 10-15%,

which primarily is a result of the enhanced efficiency. Companies' operating systems that clean/degrease and pickle work pieces can expect the highest cost reductions. Contrary to what may seem self-evident, the suppliers of materials will also benefit in the medium term since, in this case, they will have an opportunity to gainfully use their know-how.

Slide 10



- Although knowledge of the new business model is of course still slight, informed companies clearly underscore their **positive impression**: almost all of the companies reported a reduction of waste material and a – general – reduction in the use of raw materials. This indicates that expectations were justified and also represents the most important facilitating factor.
- Yet from the companies' current point of view and knowledge, this is contrasted by inhibiting factors, which may be considered typical for the early phase of implementation: nearly all of the companies deplored the **lack of information and special offers**. This almost inevitably also engenders a certain degree of apprehensiveness about how to cooperate profitably in the new business model. Analogously, a look at the global situation will reveal that most of the questions on the form of cooperation remain unanswered.
- The primary concern of interested pilot users and suppliers thus seems to be the implementation timeline of the new models.

Slide 11

**Action options of suppliers / users
with regard to chemical leasing**

Determining your position:

Is your product unique? — or merely a standard product with direct price competition?

YES Congratulations! (How long does an imitator need?)

NO Your product needs to be repositioned. There are three ways to do this:

- **eliminate inefficiency/wastage**
(„Wastage is everything the customer does not pay for.“)
- **concentrate on core competence, outsource secondary activities**
(„Everyone does what they do best.“)
- **replace old product orientation with customer focus**
(„The customer is not really interested in you, but rather for your product;
the customer is only interested in the achievable profit / the solution of the problem.“)

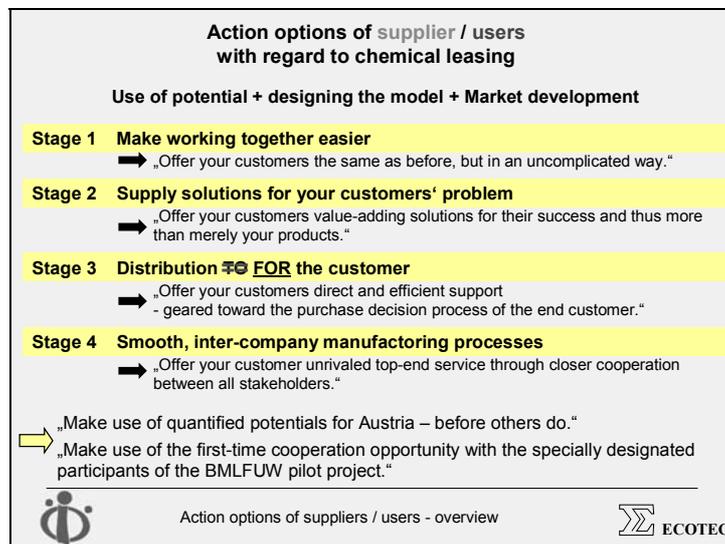
➔ **Chemical leasing is a model which**

- gives you an opportunity to reposition yourself
- takes you from the „zero-sum game“ to win-win cooperation

 Action options for suppliers/users with chemical leasing 

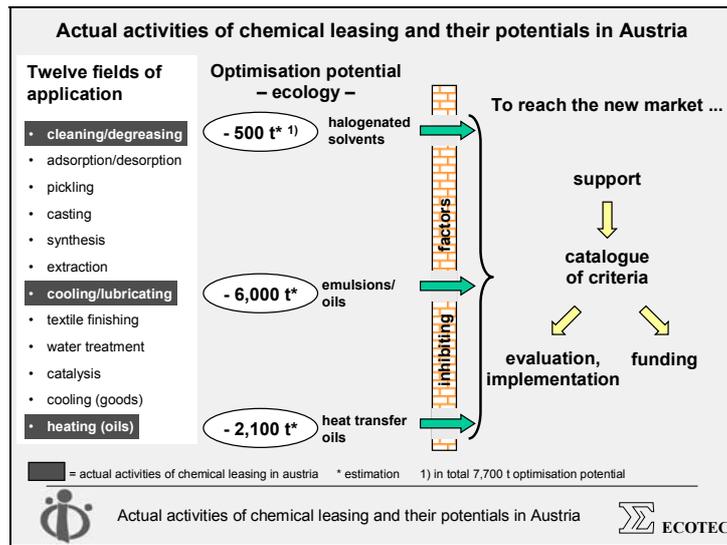
- The developed lines of actions form the supplier perspective and thus provide potential material users with an indication of what they can (and should) expect from an innovative supplier in the framework of the new business model.
- In reply to the rather rhetorical question regarding the uniqueness of one's own product, it becomes apparent that the ongoing improvement of products and the repositioning of companies is an inevitable and permanent task in the ever more difficult market conditions of today. And there are only three ways to ensure this:
 - **Increase production efficiency**
 - **Do what you do best**
 - **Manufacture for the client.**

Slide 12



- Each of these approaches is not necessarily new as such. What is new, however, is that these approaches have for the first time been **bundled into a comprehensive package** – chemical leasing – and are therefore in a position to unfold their individual effects. The frequently voiced demand to give the interests of clients more consideration has thus been a difficult task to fulfil since the basic prerequisites have not yet been met through cooperation and a better understanding by means of a new model.
- The **innovative business model** involving chemical leasing hence offers a forward-looking approach to tackle the ever more difficult market situation. Austrian companies are in a very unique position since the central questions regarding the achievable optimisation potential and the “who, what, how and whereby” have been answered and taken up. Pilot users reaping the shown benefits of chemical leasing will therefore be able to profit by developing an edge over competitors without having to take the risks that previously existed on account of the lack of knowledge.

Slide 13



- Actually, there are **several activities of implementing** the new business model chemical leasing in Austria. These activities are in different stages of implementation.
- They cover three fields of application and thus this reference cases represent

16% of 53,000 t,
which is the determined optimisation potential.

- Implementing the new business model is not an easy task because of several obstacles and inhibiting factors in practice, e.g. it needs an innovative approach to run the business. That's why the **benefits in no way results automatically** and special support can be helpful.
- Thus the following shrewd statement by the grand old man of modern management remains valid even today:
 "The biggest danger during turbulent times is not the turbulence itself, it is acting according to yesterday's logic".

*Heinz-Dieter Erbel,
Pero Aktiengesellschaft*

Experiences with chemical Leasing in Metal Degreasing Plants

Introduction

Pero AG is a medium sized, German based and family owned company with approximately 150 employees. It produces high tech cleaning machines for clients all over the world and is active in research and development on the optimisation of technical and environmental parameters. According to its advantageous effects towards better solutions for the client and the environment chemical leasing is pursued as a concept of major importance.

The concept

A main milestone for the realisation of chemical leasing is the foundation of a joint venture company that will be established as a local centre of excellence for metal cleaning in Austria.

This new company will provide to its clients innovative, chemical leasing based solutions. Chemicals and plants will not be sold to the centre of excellence nor to the clients, they will be leased.

The clients do not pay for the chemicals or the cleaning machine, they pay for the satisfaction of their demand: cleaned and degreased work pieces. The basic idea of the centre of excellence is to use highest standards for cleaning machines that enable a significant lower consumption of chemical as conventional machines. The major input comes from PERO AG which gets its turn over not for the sale of the machine but for the performance with respect to the clients demands. PERO is involved in research and development to further optimize the machines. PERO holds a share in the centre of excellence.

The chemicals are provided by SAFECHEM Umwelt Service GmbH, a company of the DOW Group. Also chemicals are not sold and SAFECHEM receives its turnover for the performance of the chemicals.

Two other partners are involved in the model. The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, represented by Dr. Thomas Jakl, that envisages to give financial and administrative support and BiPRO, a consulting company experienced in chemical leasing that will further develop the concept and the business modell.

Realisation in phase I

In phase I a cleaning machine will be available at the centre of excellence that fulfils highest standards but is not available on the market. Cleaning agent in this machine will be a solvent that fulfills the needs of the client and ensures the best available performance combined with ecological advantages.

This machine will be used for a first client (automotive supplier) to clean about 11 million pieces a year or about 800 t stainless steel.

The following ecological advantages are expected:

- reduced consumption of solvents (actually ~ 1000 l/y, in the future ~ 50 l/y)
- no more consumption of acid neutralizer (actually ~ 1000 l/y)
- reduced consumption of pH-stabiliser (actually ~ 100 l/y, in the future ~ 12 l/y)

The following economic aspects have to be balanced:

- + additional costs for high performance cleaning machine
- + additional costs for high performance chemicals
- + additional costs for further research and development
- + additional costs for foundation of joint venture
- saving of costs due to less consumption of chemicals
- saving of costs due to higher efficiency (if additional clients can be found)

Realisation in Phase II

In phase II there will be several clients, cleaning with chemical leasing will be possible at the site of the client's location.

The following questions have to be answered:

- How can various types of dirt be managed if they will be brought into the system by various clients (requirements for the chemical and the machine)?
- What kind of logistic concepts are necessary if various clients need the capacity of the cleaning machine?
- How can the ecological benefits be communicated to further clients to convince them to join the concept?

Conclusion

Pero is on the way to have an advanced chemical leasing business model running with phase I starting at the beginning of 2004. Appropriate partners are essential for a successful realisation of the concept. Key factors for success are high tech cleaning machines that enable together with the provider of chemicals significant reduction of chemical's consumption and have potential for further development. Chemical leasing will be further developed in phase II, thereafter the concept shall be expanded on the basis of the Austrian experiences.

Experiences with Chemical Leasing in Metal Degreasing

2

The Company and its background

Pero AG is

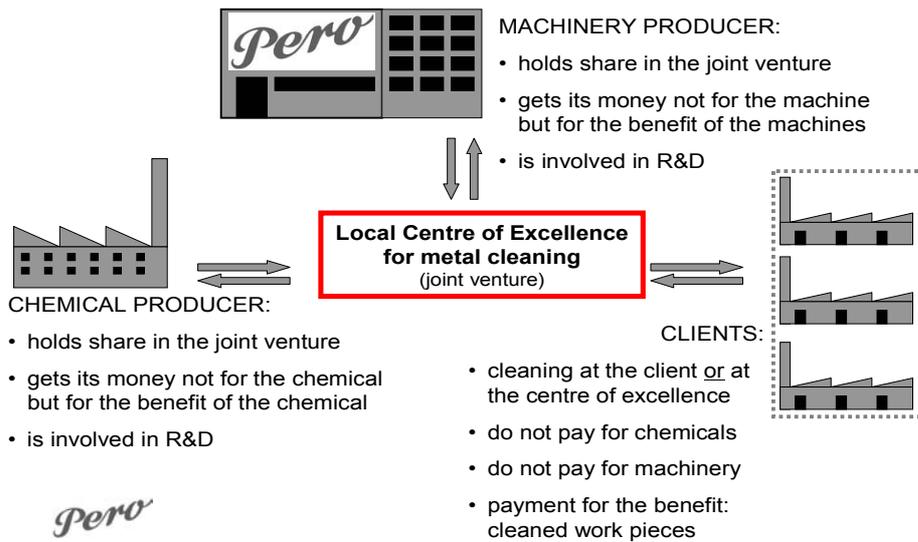
- a medium sized company with ~ 150 employees
- based in Germany and present in the world market with high performance cleaning machines
- active in research and development on the optimisation of technical and emission parameters on metal cleaning



Plants *Pero*

Pero's visions towards chemical leasing

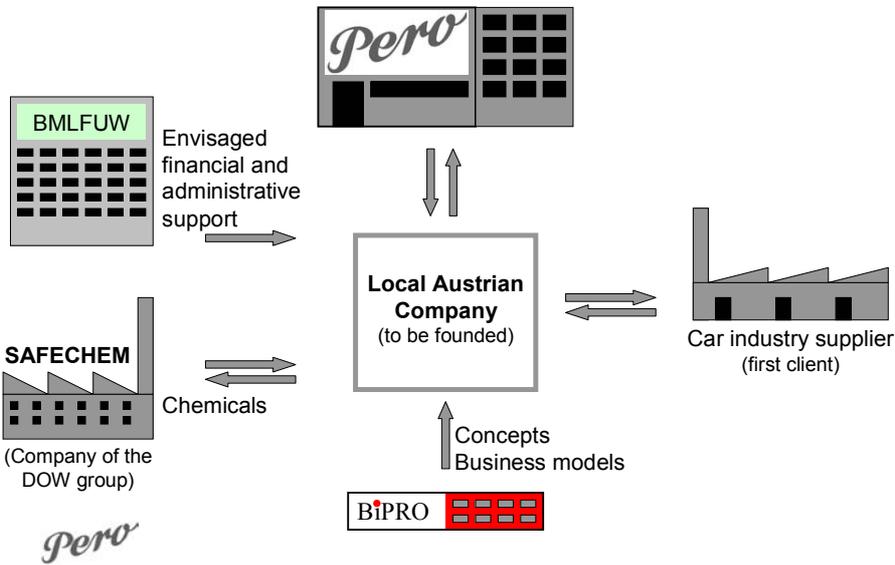
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Pero

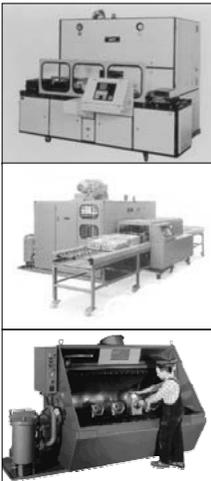
Partners of Pero in current projects

4



Machinery and Chemicals

1



Cleaning machines based on hydrocarbons

Cleaning machines based on chlorinated solvents

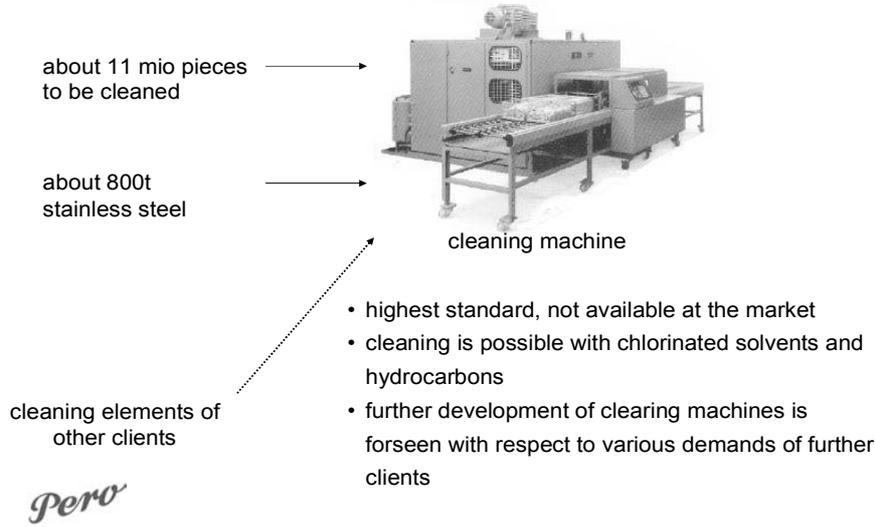
Cleaning machines based on water

Pero

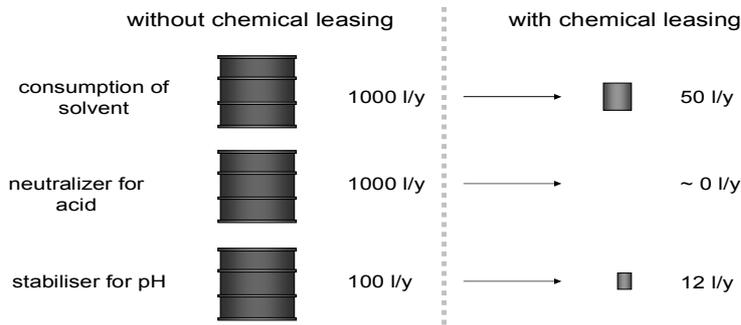
Realisation of the concept Phase I:

- development and elaboration of the concept
- contact with the first client
- foundation of the Austrian company; establishment of contracts with partners
- start with operational business on the basis of a solvent cleaning machine
- start with research and development work to minimise emissions and optimise technical parameters

Technical aspects of phase I



Ecological advantages



Pero ⇒ concept generates ecological advantages

Economic balance

- + additional costs for high performance cleaning machine
- + additional costs for high performance chemicals
- + additional costs for further research and development
- + additional costs for foundation of joint venture
- saving of costs due to less consumption of chemicals
- saving of costs due to higher efficiency (if additional clients can be found)

⇒ concept might generate economic advantages, depending on additional clients

Major open questions and research demands

- ? How can various types of dirt be managed if they will be brought into the system by various clients (requirements for the chemical and the machine)
- ? logistic concept is necessary if various clients need the capacity of the cleaning machine
- ? How can the ecological benefits be communicated to further clients to convince them to join the concept

Conclusions

- Pero is on the way to have an advanced chemical leasing business model running with phase I starting at the beginning of 2004
- Appropriate partners are essential for a successful realisation of the concept
- Key factors for success are high tech cleaning machines that enable together with the provider of chemicals significant reduction of chemical's consumption and have potential for further development
- Chemical leasing will be further developed in phase II, thereafter the concept shall be expanded on the basis of the Austrian experiences

Realisation of the concept in phase II

solvent based and water based - extended capacity at the location of the joint venture
other cleaning media - extended capacity at the location of further clients

Reinhard Joas,
BiPRO GmbH

Chemical Leasing – DOs and DON'Ts based on practical experiences

Introduction

Ideas on chemical leasing as a concept to enhance eco-efficiency of chemicals have been set up by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management. Based on this first initiative various activities have been started by industry, federations, other ministries and consulting companies. Chemicals for metal cleaning, galvanics and painting are also covered by first experiences as chemicals used for adsorption or catalysts. The new ideas have even spread beyond chemicals to technical commodity goods like abrasives. Also in this field the basic objective is to enable both, economic and ecological advantages by changes from the selling of a product to the sale of the services rendered by a chemical or a product. In the following some conclusions of practical experiences are drawn and attributed to do's and don'ts. As the process needs both, industry and authorities, all players are addressed.

DOs and DON'Ts or possibilities to learn from practical experiences

Experience 1: Chemical leasing concepts are no "self running processes". You need an initiator and some "catalysts" to start the "reaction".

The intention of chemical leasing is to provide economic and ecological advantages. However, at the present status a new thinking is necessary and there are a lot of risks and open questions. So try to find initiators that are able to promote the process and to find answers to open questions. Entrepreneurs are necessary that take the risk and see the chances. A public relation platform is necessary to convince clients and speed up the process.

Experience 2: You need a clear business modell

Three basic modells show the most promising success in Austria and are the basis of practical experience.

Experience 3: Integrate chemical leasing in marketing and network development strategies

Chemical leasing includes chances as a strategic tool to find new partners, new clients and to open new markets.

Experience 4: Authorities and federations can support the process

The chances mentioned in experience 3 should be supported by authorities and federations

Experience 5: Essential partners are suppliers of plants/machinery

A good cooperation between a chemical producer and suppliers of plants or machinery seems to be a crucial factor for success in many applications. The cooperation between those partners within chemical leasing concepts typically enables an added value for the client.

Experience 6: Recycling companies often strengthen a chemical leasing concept

Closing material flows is a goal within chemical leasing concepts. For this purpose it seems appropriate to include recycling companies as partners.

Experience 7: Take care of know how protection and don't neglect internal communication

Know how and communication issues often define open questions. Answers are available based on existing experiences.

Experience 8: Don't stick to close to chemicals. Use synergies between internal and external chemical recycling

Practical experience show that it might be interesting to check both, the applicability of chemical leasing concepts as a tool to support marketing of products and as a tool to support own production processes.

Experience 9: Use chemical leasing as opportunity for joint research activities

Joint ventures of companies interested in chemical leasing have been build to apply for funds within research programmes. It seems interesting for all involved partners to use the chances to further develop chemicals, technologies, products and business concepts.

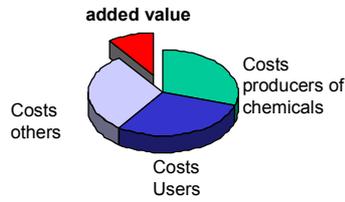
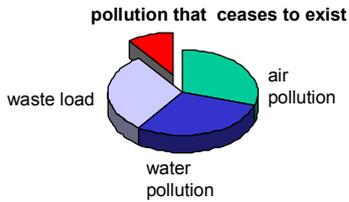
Conclusion

Chemical leasing concepts are an innovative and future oriented approach. Time is right today to enable economic and ecological advantages tomorrow. The use of already existing experiences will help to be successful and to avoid misdirected investments.

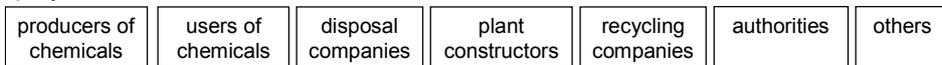
Chemical leasing in Austria: Basis for a sustainable development

Environment:
lower emissions
due to higher efficiency of chemical's use

Economy:
win-win situation
with added value that can be shared



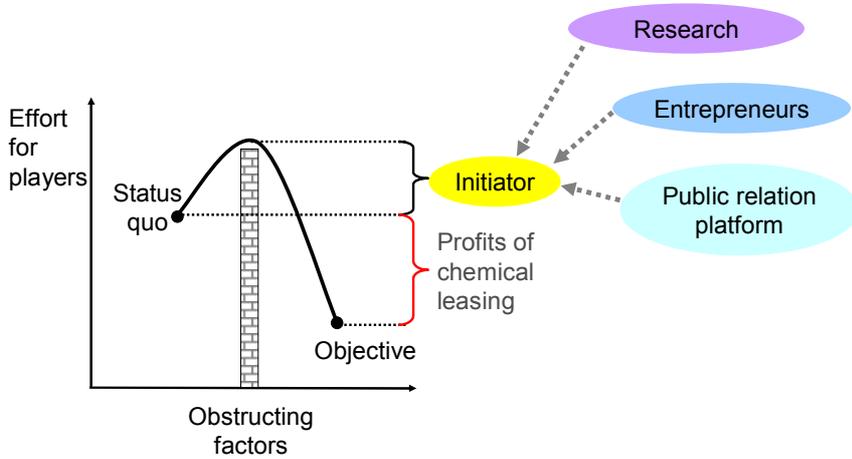
players:



DOs and DON'Ts

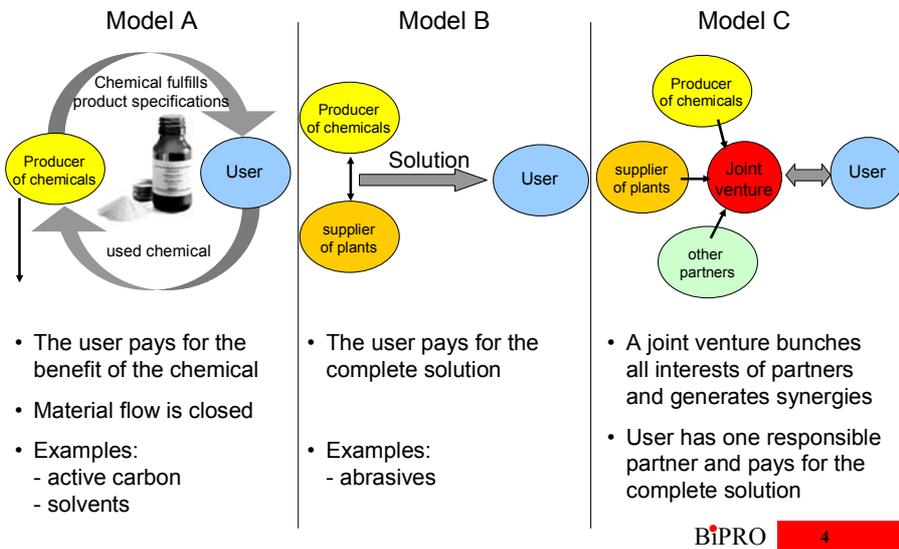
BiPRO 1

Experience 1 Chemical leasing concepts are no „self running“ processes!
You need an initiator and some „catalysts“ to start the „reaction“



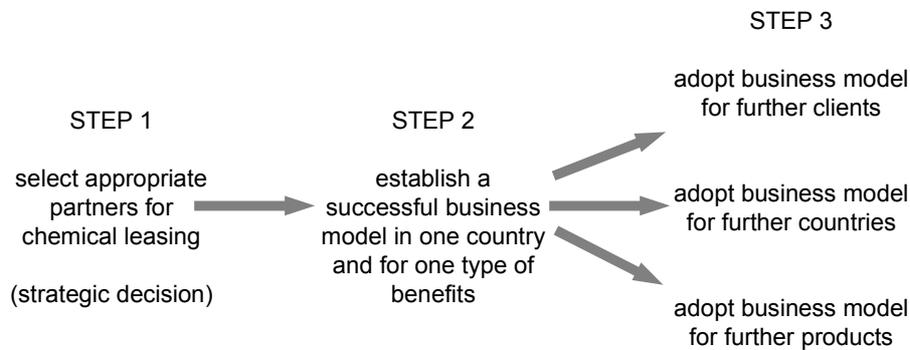
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Experience 2 You need a clear business model!

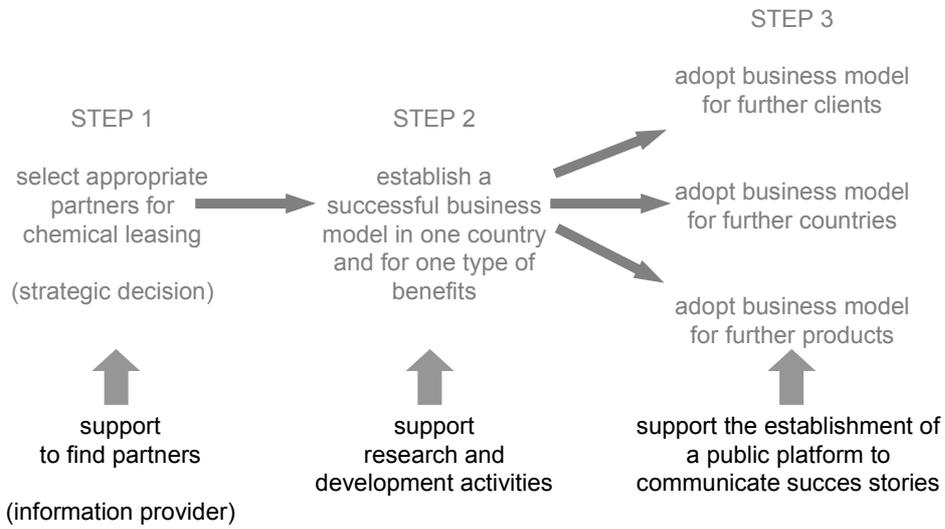


Experience 3 Integrate chemical leasing in marketing and network development strategies:

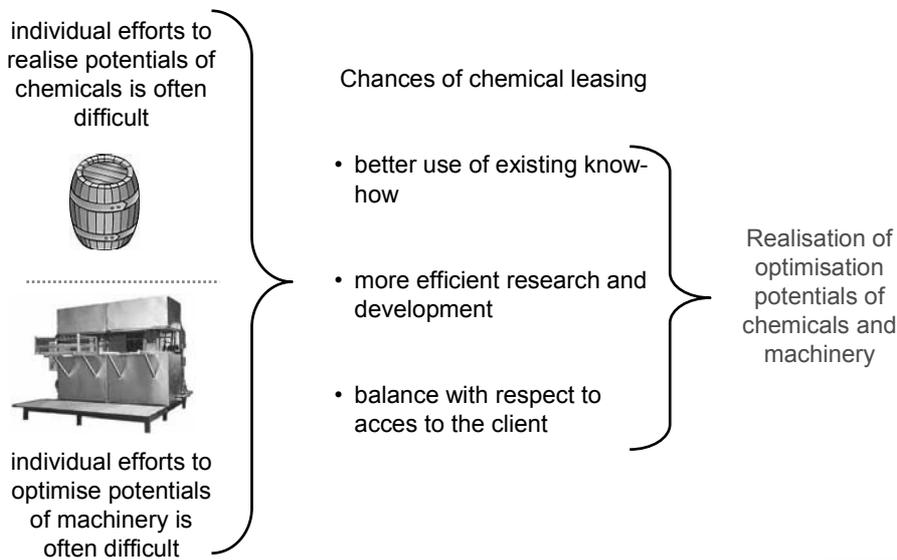
Company choices



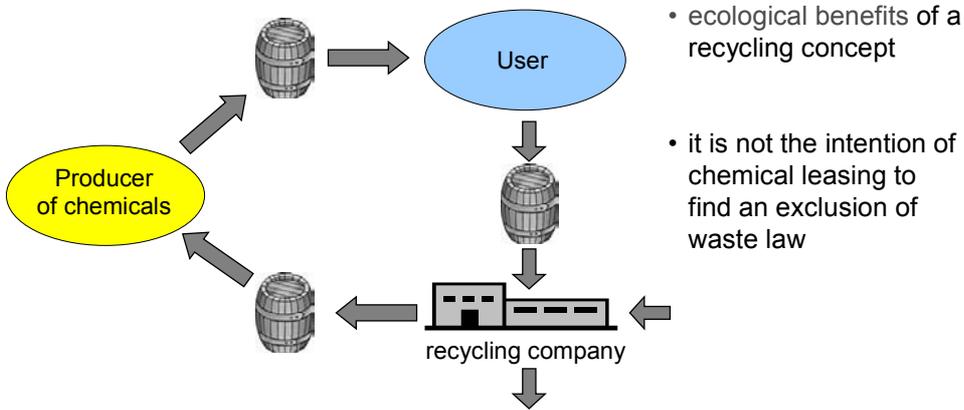
Experience 4 Authorities and federations can support the process



Experience 5 Essential partners are suppliers of plants/machinery



Experience 6 Recycling companies often strengthen a chemical leasing concept



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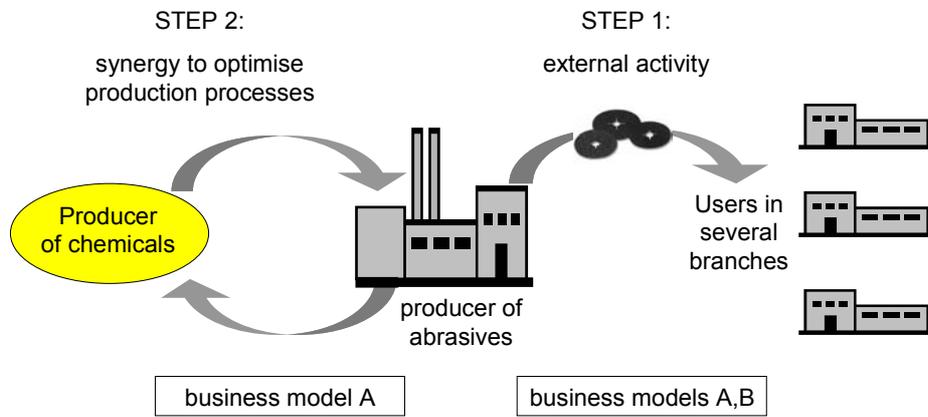
Experience 7 Take care of know how protection and don't neglect internal communication!

- ⇒ Communicate the business model to your staff.
In many cases they are afraid to give away their competence and to lose their job (what is neither the intention nor the consequence of chemical leasing concepts).
- ⇒ Establish sometimes clear contracts with your partners on intellectual property rights.
Try to find a good balance between necessary protections and communication of know-how.
- ⇒ Check pros and cons of models A / B / C

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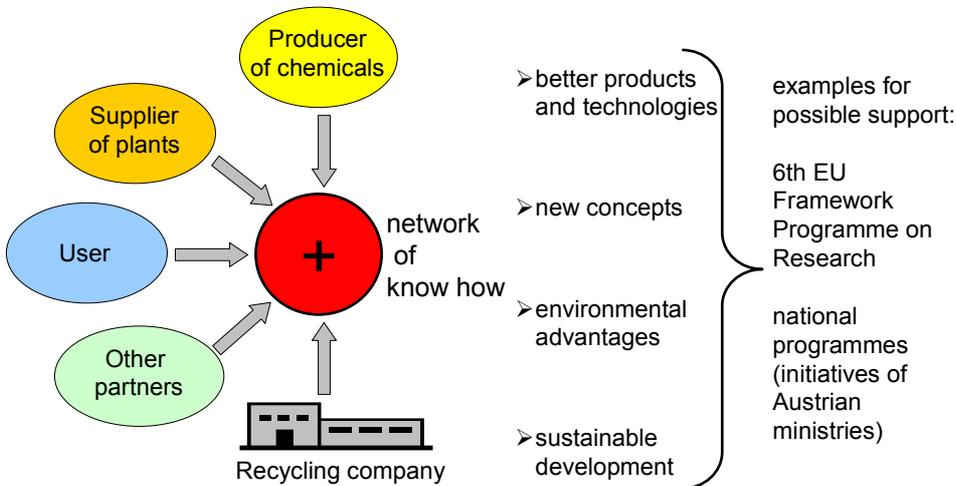
Experience 8 Don't stick to close to chemicals!
Use synergies between internal and external chemical leasing!



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Experience 9 Chemical leasing can be an opportunity for joint research activities

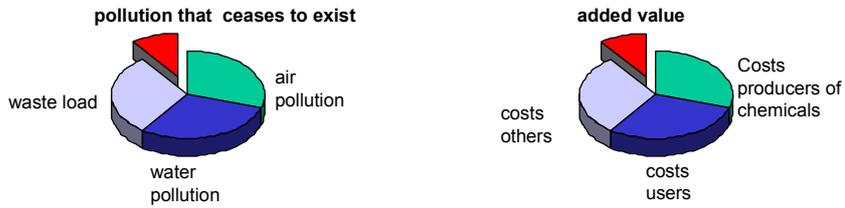


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Experience 10 Don't speak too long, make your conclusions

- Chemical leasing enables both: environmental and economic advantages



⇒ Chemical leasing is in the interest of industry and authorities

⇒ Use of existing experiences will help to be successful and to avoid misdirected investments

Rudolf Schott,
AFC Consult GmbH

Industrial Eco-Leasing-Concepts based on Abrasive Industry Approaches

Introduction

Abrasives are traditional products that are mainly offered as tools for surface treatment. They contain a complex mixture of various chemicals. The abrasive industry offers products based on a huge amount of different formulations and ingredients to its clients. The branch in Europe is characterised by a few big players with a significant share in the world market and furthermore about 200 small and medium sized companies.

Austria provides an outstanding good background for the development of new business concepts. On the one hand there are innovative ministries that support new thinking and future oriented concepts, on the other hand there are abrasive producers with world wide importance and good relations to industrial federations.

Approaches of the abrasive industry

When it comes to check whether a leasing concept for abrasives can be a realistic option for the abrasive industry, the major answers have to be found with respect to the following questions:

1. Are there quantifiable benefits of abrasives that are suitable as a basis for payments?
2. Is recycling possible?
3. Is a reduction of emissions or waste achievable with leasing concepts?
4. Do leasing concepts enable potentials for further development of abrasives?

All four questions can be answered with “yes”.

Direct leasing concepts with return of used abrasives as the most simplest version reveal a lot of problems in practice. For the producer the risk with respect to liability would increase. In addition capacities and know how for used abrasives are missing and significant investments would be required. This general concept will work much better if a recycling company is included for the material flow of used abrasives.

Another leasing concept type has already been installed with more than 100 contracts. This concept is based on sale of know how and on a benefit specific charging instead of a pure scale of products. This concept leads to good feed back from clients and shows economic and environmental advantages.

A third concept is followed to built up joint ventures between the producer of machinery and the producer of the abrasives. The following advantages are expected:

- better contacts to the client
- better cooperation with machinery producer
- higher profits
- no enlarged liability

This concept is seen within a vision of new marketing sales and network strategies. However, as competition is very important in the abrasive industry not too many details will be available on these concepts in the public.

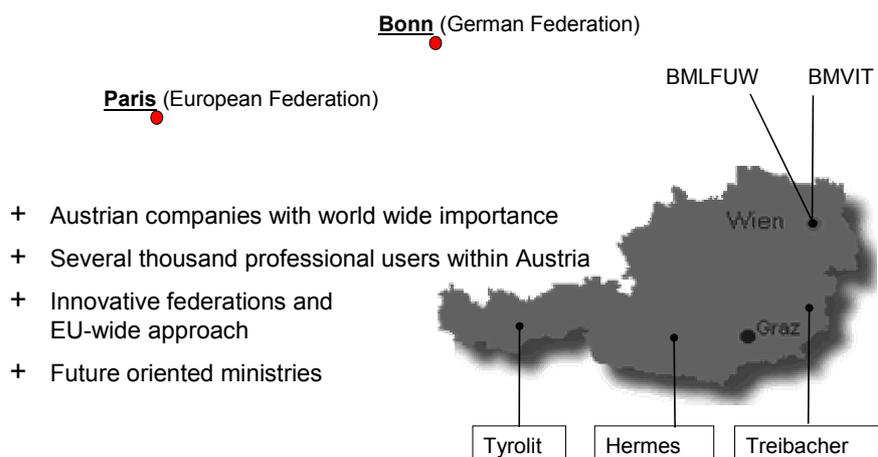
Conclusion

Leasing concepts are an interesting new approach for the abrasive industry. Business models are on their way, some are already installed, some have still to be developed in detail. Positive spin offs from chemical leasing exert their impact in the fields of economy and environment. Due to the high competition in the abrasive industry public available information on successful business models is quite limited. It can be assumed that at the end of the day leasing concepts in the abrasive industry will provide both: economic and ecologic advantages.

Industrial Eco-Leasing-Concepts based on Abrasive Industry Approaches

Abrasives industry has good starting conditions for pilot projects on eco-leasing

2

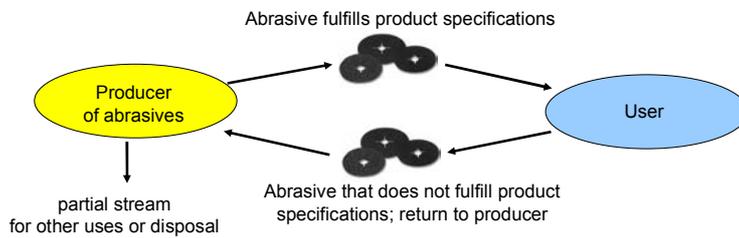


Is chemical leasing possible and is it of interest for the abrasive industry?

chemicals within abrasives	benefits of abrasives	type of waste	potentials
<ul style="list-style-type: none"> - silicon carbide - corundum - pheolic resin - cryolite - ferric oxide - cobalt - ... 	Surface properties	  identical physical-technical properties	<ul style="list-style-type: none"> • formulations • lifetime • recyclability • productivity

(+) reduction of emissions and waste	(+) benefits quantifiable	(+) recycling possible	(+) potentials can be realised
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Experiences with basic model A concepts show deficits in practice

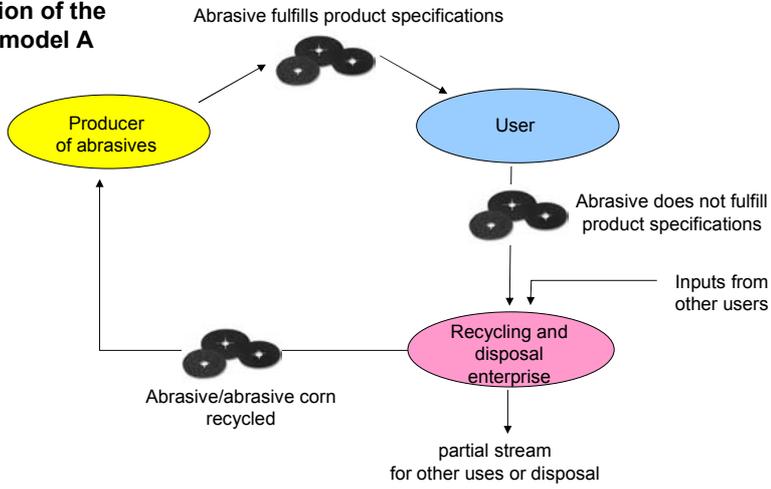


- + advantages less waste; closer connection to object, long term customer relation
- difficulties higher risk for supplier (wo is responsible if problems turn up)
 need for investment;
 missing capacities and know how for recycling
 problems to quantify benefits in case of product flexibility

5

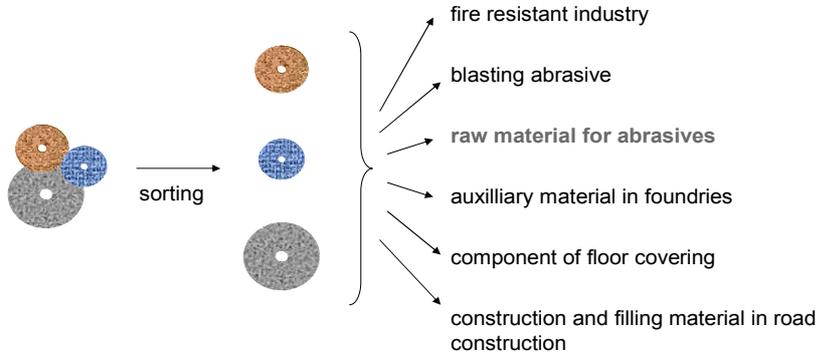
Involvement of recycling companies makes concept more attractive

Variation of the basic model A



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Inclusion of recycling companies increases benefits

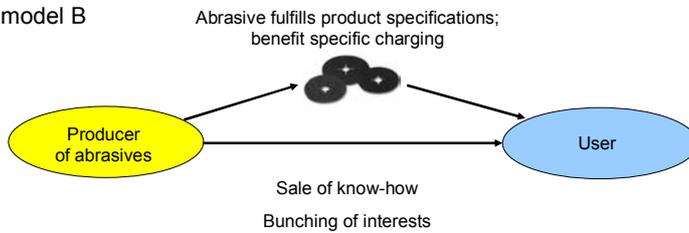


Consequence: ecological and economic advantages results as a spin off from chemical leasing

The basic model B ("bunching of interests and sale of Know-How") is appropriate for chemical leasing and in praxis already partly established

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basic model B

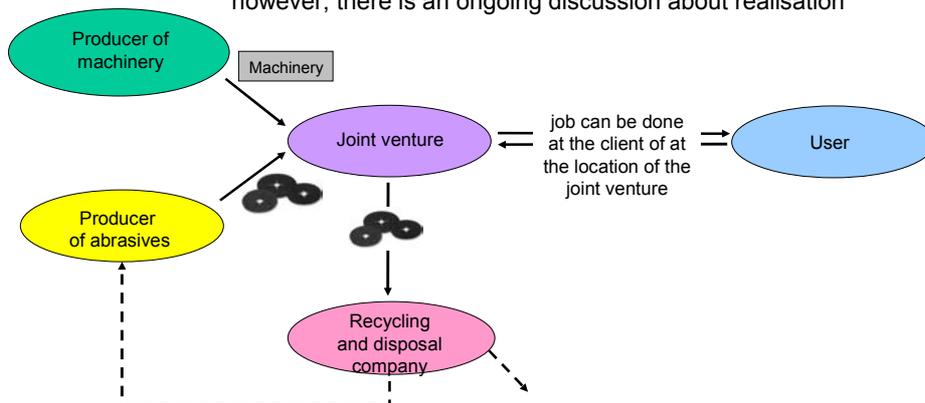


advantages : less waste
better profits by selling know how
good feed back of clients

disadvantages: problems to quantify benefits in case of product flexibility

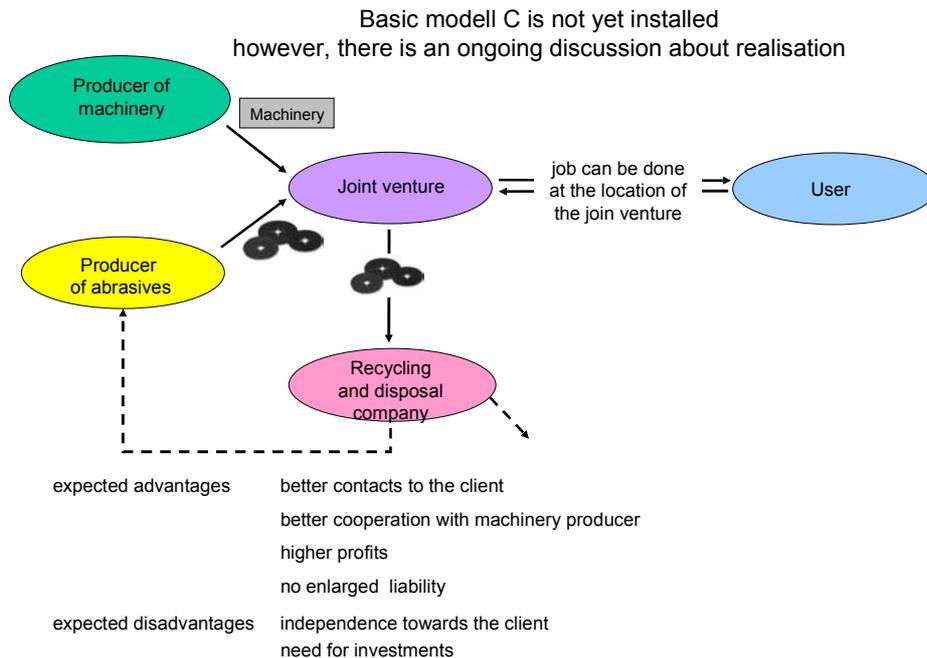
Basic model C is not yet installed
however, there is an ongoing discussion about realisation

8



expected advantages better contacts to the client
better cooperation with machinery producer
higher profits
no enhanced liability

expected disadvantages independence towards the client
need for investments



Summary of hindering factors and risks

- Necessity for persuasion (internal and external)
- Investments required
- Higher efforts for administration and
- Legal insecurity
- Questions on liability and assurance
- Structural adjustment
- Closer binding to suppliers of machinery

Summary of stimulating factors

- Client satisfaction
- Economic competitiveness
- Cost savings for sales
- Better profits
- Motivation of employees
- Environmental benefits / better resource efficiency
- Enhanced reputation / credibility

**Christian Weigel,
Arthur D. Little GmbH**

Service Strategies for Value Enhancement in the Chemical Industry

The global market for chemicals can be divided into two main segments – basic chemicals and specialty chemicals. Service clearly plays a more important role for specialty chemicals than for basic chemicals, which are largely sold on the basis their price. In specialty chemicals three different service levels can be distinguished. Whereas, besides the product itself, only general information is offered on the lowest level as a service component, the level of the technical services additionally includes customer specific information, advice and training. The highest level, the level of integrated service, finally covers complete service packages, such as financing or the total management of the chemicals cycle. (Figure 1)

A range of already integrated service concepts, as e.g. Value Chain Management, Chemical Management, Life Cycle Management, or Financial Services is presented through a series of concrete examples and the success of companies with these concepts is discussed.

With these integrated service strategies chemical companies do not only succeed in achieving higher-than-average growth, but also in achieving better financial figures than the average industrial sector, s e.g. ROCE (Return on Capital Employed) and TRS (Return to Shareholder Value). s e.g. ROCE (Return to Shareholder Value).

Figure 1

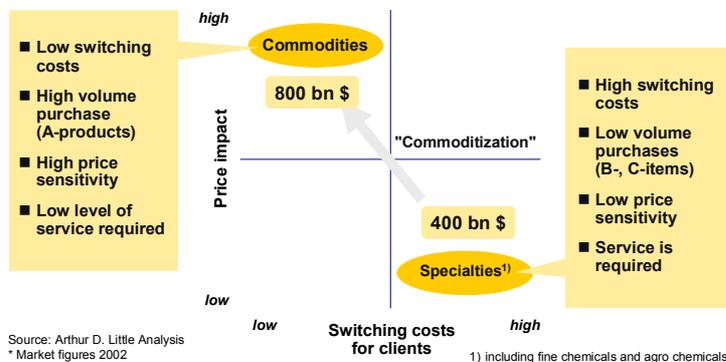
Many companies in the chemical industry already successfully offer service concepts

	Description	Example
Value Chain Management	Acceptance of a complex assignment in production	BASF Coatings, PPG, DuPont
	Acceptance of assignments in development, upscaling and production of key raw materials for the Life Science Industry	Lonza, Degussa Clariant, DSM
Chemicals Management	Acceptance of assignments in logistics-, distribution- and controlling for the customer	Nalco, Ecolab Air Products, Vopak
Life Cycle Management	Recycling or disposal of used and contaminated chemicals as part of product delivery contract	Rhodia EcoService
Financial services	Sales of chemical products completed by financing- and risk management services	J. Matthey

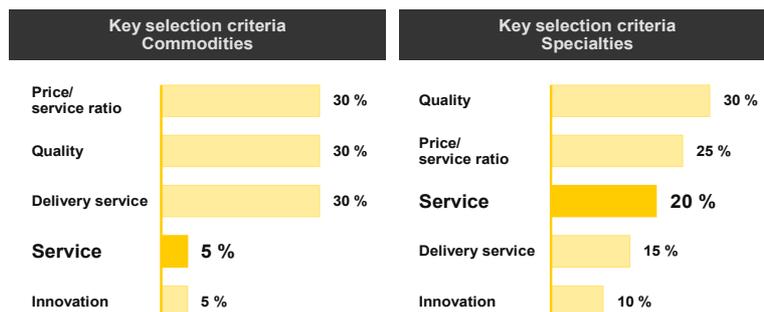
Source: Arthur D. Little

Service concepts in the chemical industry - Segments

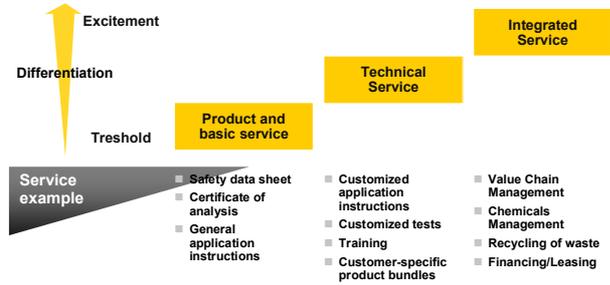
Clients classify specialty and commodity chemicals differently*



Service is more important for specialties than for commodities



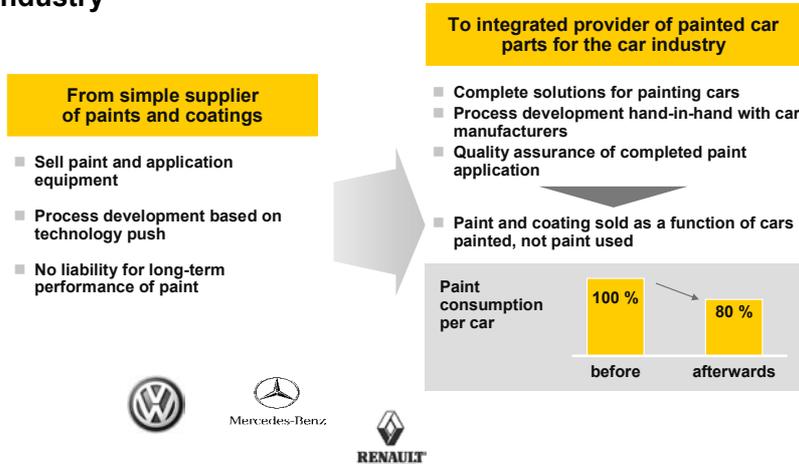
Integrated service is the highest of the three possible service levels in the chemical industry



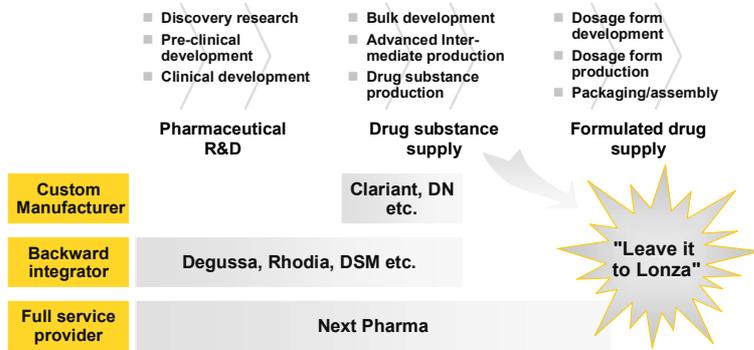
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BASF Coatings takes over "Paint Shops" of the automotive industry



Lonza's pioneer achievements were followed by many others



Nalco, the global market leader for water treatment, provides different service levels - from technical service to fully integrated service

Technical Service

- Help Desk
- Guidance in using the right chemicals
- Laboratory analysis to control quality
- On-site trouble shooting
- Identifying and treating problems
- Adjusting the water treatment unit
- Laboratory analysis and judgement of results
- Partly or full maintenance of plant
- Full maintenance of the water treatment unit according to agreed quality standards

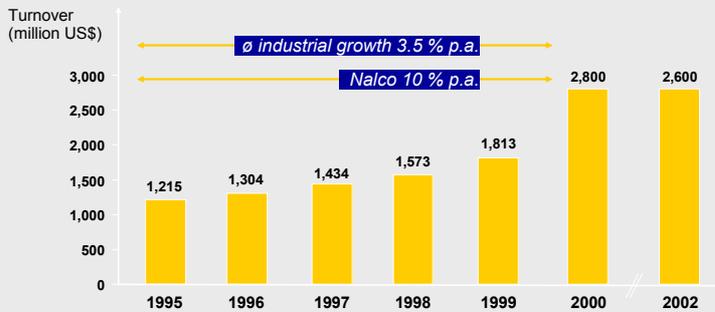
Integrated Service

Nalco's "preferred supplier" approach has changed the paper chemicals market



Service concepts in the chemical industry - Chemicals Management

On the basis of the service concept, Nalco's market share grew constantly



Source: Hoovers Company Capsule

Arthur Little

Ecolab, the cleaning and hygiene service company, provides a large number of customized service packages

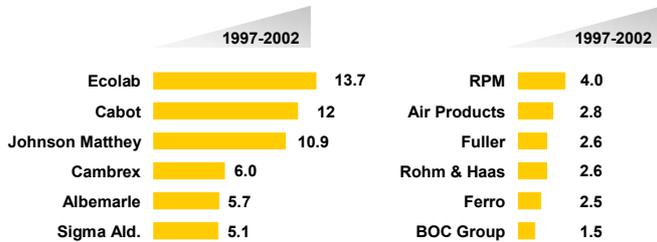
<p>Vermin extermination</p>  <ul style="list-style-type: none"> The service consists of an initial extermination of pests in combination with regular control visits to achieve permanent absence of pests Business is growing annually by approx. 9 % 	<p>Dry cleaning of textiles</p>  <ul style="list-style-type: none"> Ecolab provides traditional detergents and bleaching agents for those who run commercial laundries and hotels The range of offerings includes services such as consulting service, training, total cost management and water treatment 	<p>Pool-services</p>  <ul style="list-style-type: none"> Ecolab uses the experience in water treatment by offering it for pools Apart from chemical water treatment the offer includes control visits by service technicians, remote monitoring of water quality and emergency services
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Ecolab's acquisition strategy has been - and still is - focused on the expansion of the service business

Ecolab acquisition (examples)		Ecolab sales (examples)
<ul style="list-style-type: none"> 1995: Water Care Services (water treatment products and services) 1995: Western Water Management (water treatment service) 1995: Industrial Maintenance Corp. (water treatment service) 1997: Vehicle Care (Products and services for car washing) 	<ul style="list-style-type: none"> 1998: GCS Service (repair service for commercially used kitchen facilities) 2001: Microbiotecnica (vermin extermination service, Brazil) 2001: Commercial Parts & Service (repair service for commercially used kitchen facilities) 	<ul style="list-style-type: none"> 2000: Jackson sold to Enodis (production of commercial washing machines)

Ecolab is the TRS Star among the providers of specialty chemicals

➔ Total return on shareholder investment (TRS)¹⁾ / CAGR, in percent (Companies with positive TRS only)



Source: Datastream, Arthur D. Little Analysis 1) share value + dividends reinvest

Service concepts in the chemical industry - Chemicals Management

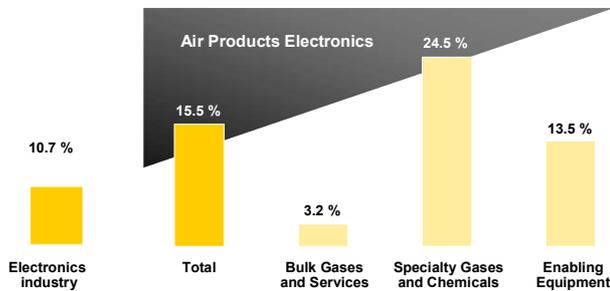
Air Products takes over the complete management of gas and chemicals supplies for chip plants

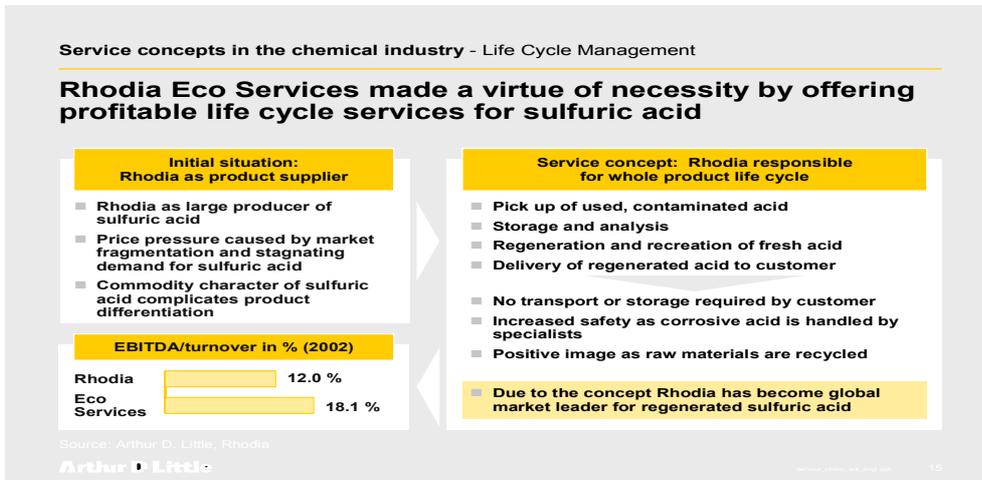


- | | |
|---|---|
| <p>Air Products provides</p> <ul style="list-style-type: none"> ■ guarantee of uninterrupted supply of gases and chemicals ■ availability of personnel at site ■ on-site gas production ■ allocation of equipment for gas handling ■ analytical and engineering services ■ all required maintenance work | <p>Air Products service personnel in a typical chip plant</p> <ul style="list-style-type: none"> ■ 1 site manager ■ 1 site engineer ■ 5-15 technicians ■ support through the regional technical center |
|---|---|

Based on this service concept Air Products grows faster than the electronics industry

➔ Growth rate (1996 - 2000)

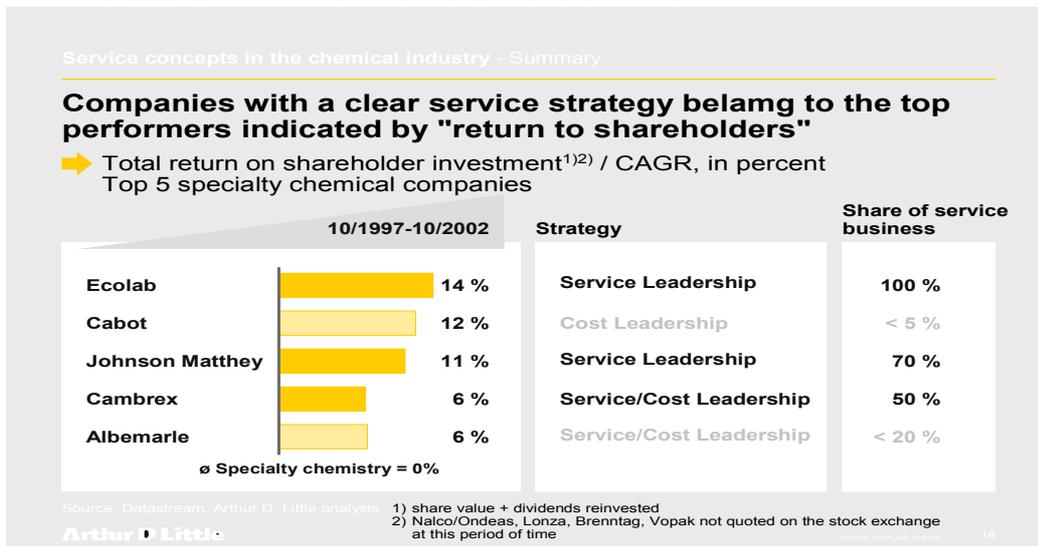




Chemical companies with a clear service strategy share some key characteristics

Chemical companies with a clear service strategy...

- produce a higher average "Total Return to Shareholder" (TRS) than the industrial average
- react less cyclically than the industrial average
- reveal higher growth and better ROCE-values
- acquire primarily to strengthen the service business
- fulfill the success factors of the "Service-Stars"



Companies with a clear service strategy fulfill the success factors of the "Service Stars"
Example Nalco/Ondeo

They "live" service

- Service is a key issue for top management

- Communication not product- but service-oriented

They establish a clear cost/ benefit ratio

- Payment in chemicals consumption per produced unit
- Target: reduction of annual chemicals costs for the client

They set measurable targets

- Contracts with at least three-year period of validity
- Continuous reduction of consumption as target

They organize their services in a profit center

- Organization by customer industries

They focus on their service-staff

- Clear incentive system for each employee (customer satisfaction, increase in results/turnover per customer)
- Clear career options (on-site server-employee \uparrow server consultant, regional \uparrow account manager)

Service concepts will substantially strengthen companies in dealing with the challenges of the chemical industry

Avoidance of commoditization-

- Commoditization in the chemical products business will be further increasing and expanding to broad areas of specialty chemicals
- New services offer an opportunity for differentiation at a time when differentiation via innovation is getting more difficult to achieve

Sustainable profitability

- Services offer the possibility of achieving higher margins as the market for services is less transparent
- Services support customer retention - another way to stabilize margins

Attractiveness for employees

- Service concepts guarantee a broad and innovative field of activity for motivated and talented employees

Continuous growth

- The obligation for publicly owned firms to grow is limited by legal limitations (e.g. antitrust laws)
- Service offerings allow product-focused companies to grow further without having to increase their market share in products, thus avoiding legal limitations

Service concepts in the chemical industry - Outlook

... we are helping you: Five steps to success

