

„Global Chemical Leasing projects and strategies to support resource efficiency and green chemistry”



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

United Nations Industrial Development Organization (UNIDO)



Promotes sustainable industrial development throughout the world

- ✓ UNIDO was set up in 1966 and became a specialized agency of the United Nations in 1985.
- ✓ As part of the United Nations common system, UNIDO is throughout the developing world, in cooperation with its 171 Member States.
- ✓ Its headquarters are in Vienna, and it is represented in 35 developing countries.



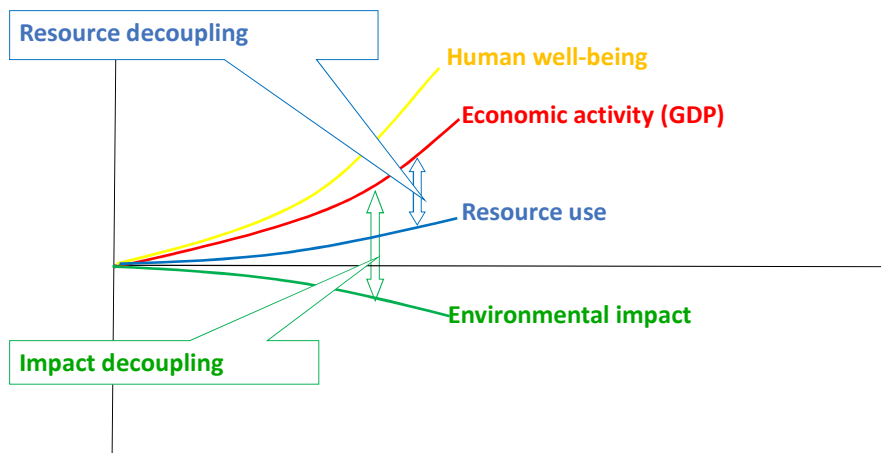
Today's Challenges



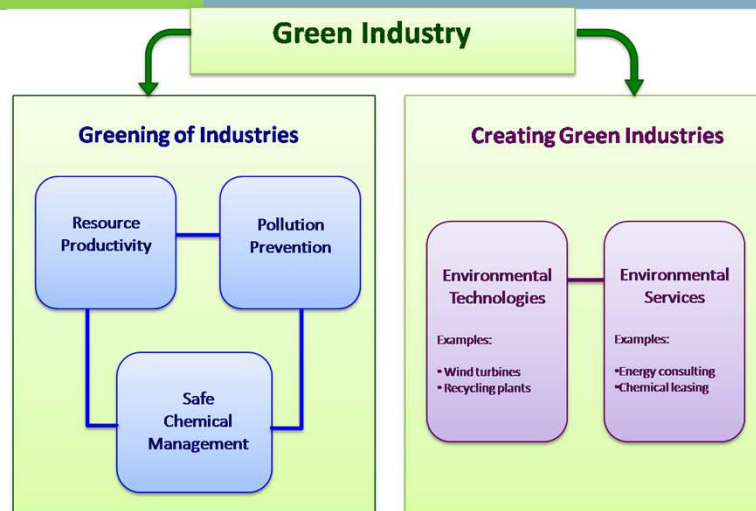
- The adopted patterns of use of materials and energy are unsustainable and rapidly deplete the world's available resources.
- Consumption is leading to increases in waste and pollution, which in quantity and in toxicity, are overwhelming the assimilative capacity of the world's ecosystem.
- Industry is one of the main contributors in the hazardous wastes generation.
- SMEs lack expertise in terms of waste and sound chemicals management.
- There is a need to investigate, encourage and apply new models of economic and social development.

Source: State of the world, 2008
Innovation for a Sustainable Economy, Worldwatch Institute

Decoupling for sustainable economic growth



Green Industry



Supporting Green Industry



In 2005 UNIDO launched the Global Chemical Leasing (ChL) Programme



Chemical Leasing is in line with the UNIDO Green Industry approach

ChL, based on the preventive resource efficient and cleaner production concept, provides practical solutions for industry to become more efficient, as well as reduce unnecessary hazardous chemical consumption, and protect human health and the environment.

Implementation at national level



UNIDO's ChL programme has been successfully implemented in close cooperation with the National Cleaner Production Centres (NCPCs) of mainly 6 countries: *Colombia, Egypt, Mexico, Russia (St. Petersburg), Serbia and Sri Lanka*



In 2011 new initiatives have started in *Brazil, Croatia, Ukraine, Russia (Volga region) and Nicaragua*

National Cleaner Production Centres are partners of the UNIDO/UNEP Global Resource Efficient and Cleaner Production (RECP) Network

→ It includes nearly 50 National Cleaner Production Centres globally

Defining Roles



Role of UNIDO

Act as a catalyst and facilitator

- global networking
- tools development
- coordination of NCPCs

Act as national focal points

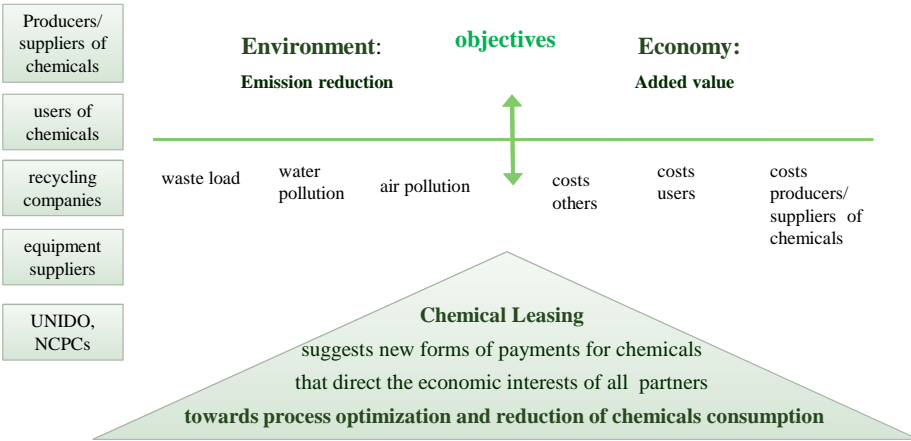
- national networking
- training + PR
- demonstration projects

Role of NCPC/National Partners

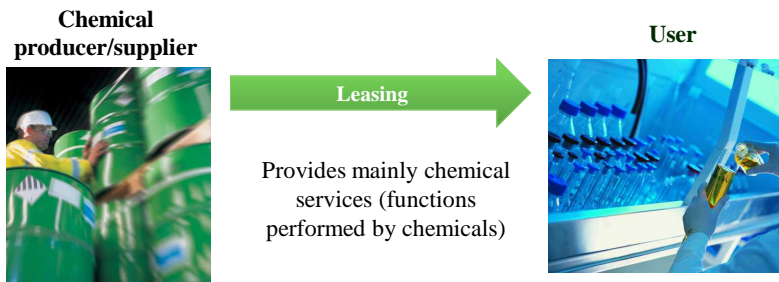
Chemical Leasing: Concept



players



Chemical Leasing: Payment



Payment not for the chemical itself, but for the benefits of the chemical (e.g. not for tons of solvents used, but for number of pieces cleaned!)

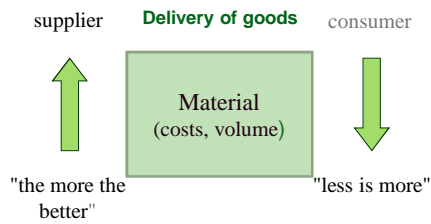
... amount of produced chemicals will decline as chemicals volume turns from a factor for earnings ("the more you sell the more you earn") to a cost driver ("less is more")

Chemical Leasing: Motivations



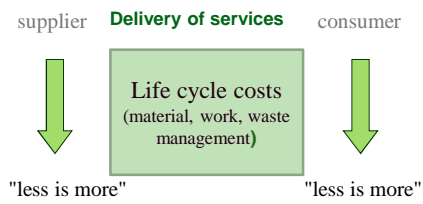
Traditional business models:

Contradictory motivations



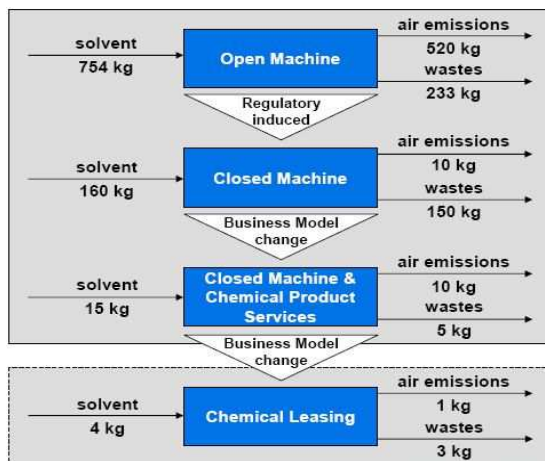
Chemical leasing models:

Bundled motivations



Willingness and culture of corporation is required

Bundled motivations: Industrial surface cleaning



Legislative approach

Supplier approach

Service business model - Chemical Leasing

Increase efficiency of solvent use
Reduced environmental impact



Cleaning of metal parts



Solvents

Classical business model: payment per t of solvents

Chemical Leasing: payment per m³ cleaned surface
or per number of cleaned parts

Chemical Leasing: Main benefits



User of chemicals

does not pay to own a chemical, but spends money for the benefits provided by a chemical



Supplier of chemicals

sells the function of a chemical, including know-how on efficiency and risks, adding management services like production management and logistics



Amount of chemicals used and produced

will decline as reduction potentials are obtained due to the intensified collaboration; chemicals volume turns from a factor for earnings ("the more you sell the more you earn") to a cost driver ("less is more")



Payments and added value

Payments are based on benefits; added value will be shared in a fair way among the involved partners

Sectors/Chemicals



Experience has shown that it is best applied to processes that are not the core know-how of the chemical user, such as cleaning, de-greasing, painting, etc.

Chemical leasing pilot projects successfully introduced:

Industry sectors/processes	Chemicals
Manufacture of electronic equipment	Coating powder
Car manufacture	Hydrocarbon solvents for cleaning
Various industries/steel treatment	Galvanizing and phosphating agents
Beverage production	Lubricants for packaging conveyers
Waste water and drinking water treatment	Water treatment chemicals
Accommodation and service sector	Cleaning & disinfectants chemicals
Beverage and food-processing	Glue
Petrochemical industry	Catalysts and water treatment chemicals
Agriculture	Pesticides
Printing Industry	Ink, printing chemicals

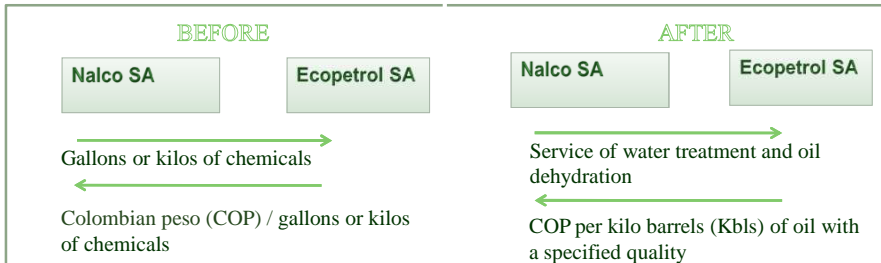
Case 1: Water purification and oil dehydration



Country	Colombia
Supplier:	Nalco SA
User:	Ecopetrol SA
Industrial process:	Water purification and oil dehydration
Chemicals:	Water purification chemicals



Case 1: Water purification and oil dehydration



- Operations with a high consumption of chemicals
- High operational costs
- Low efficiency and potential risks in the oil fields
- Low level of control over chemical yields
- Commercial relationship only based on price

UNDER ChL :

- New strategy and partnership model were developed in order to better suit the company's global vision
- Best practice in the field analyzed
- Operational optimization of oil and water treatments

Case 1: Benefits gained



Economic Benefits:

- Cost reduction in the water treatment process by almost 20%
- Reduction of the polymer residues in the stabilisation pools and the waste water
- Adjustment of the yield of the equipment
- Reduction of oil and grease in the cooling towers
- Reduction of drums used for transportation and storage

Environmental Benefits:

- Removal of 99% of the oil and suspended solids from the waste water
- Reduction in polymer consumption

Social benefits:

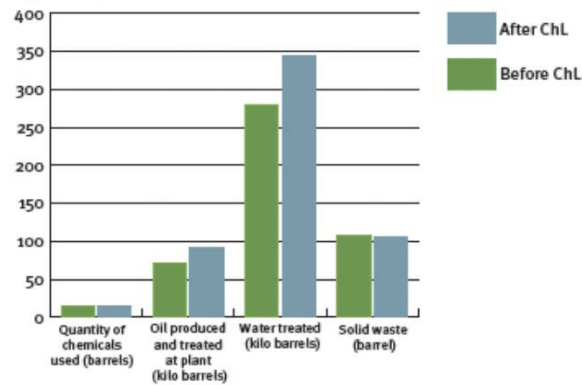
- Creation of new jobs (in the laboratories)
- Long-term commercial relationship
- Risks reduction and better working conditions

Savings for Nalco: US\$ 164,630 (2008), US \$ 249,418 (2009)

Case 1: Benefits gained



Figure 1. Results table



→ *Reduced chemicals consumption of 113 tonnes/year*

Case 1: Energy consumption



Total energy consumption per year: ca 3,400 MWh

- Direct via electricity: ca 50 MWh
- Indirect via materials: ca 3,350 MWh

Reduced chemicals consumption due to Chemical Leasing is 113 t/year

Energy consumption for production of 113 t/year of chemicals = 500 MWh

→ 15% **indirect energy reduction**

Direct energy consumption: ca 50 MWh remains about the same under ChL

→ **Reduction of the total (and indirect) energy consumption via Chemical Leasing is 10 times higher than the direct energy consumption**

Case 2: Bonding of boxes



Country: Serbia
Supplier: Henkel
User: Bambi
Industrial process: Bonding of boxes
Chemicals: Adhesive

Unit of payment:
Number of bonded boxes

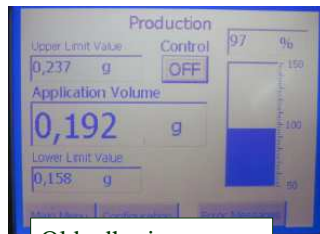


Case 2: Bonding of boxes



UNDER ChL :
Chemical is substituted
Application conditions are changed

Adhesive	Application temperature (°C)	Application pressure (bar)
The old one	160	2,9
The new one	130	1,8



Old adhesive



New adhesive

CHEMICAL (ADHESIVE) CONSUMPTION IS 30 – 40 % LOWER

Case 2: Benefits gained



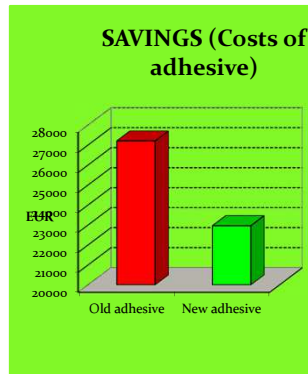
IMMEDIATE COST SAVINGS (Measurable instantly)

- Costs for adhesive
- Energy costs (lower application temperature, lower pressure)
- Maintenance costs
- Cleaning cost

MEDIUM TERM COST SAVINGS (Measurable after certain time)

- Spare part costs (nozzles, pipes)

For BAMBI (user)



Besides, environmental and working conditions improvements

Case 2: Benefits gained



For Henkel (supplier)

Competitiveness and relations

- Better relationship with Bambi
- Threat from competitors is significantly reduced

Economic and environmental benefits

- Services are a part of the product price
- Transportation costs and storage costs are lower
- Lower consumption of chemicals;
- Lower energy consumption



Tools and instruments developed

- ChL toolkit to facilitate ChL implementation at plant level
- ChL book and video
- Case study brochure
- Sustainability criteria for ChL business models
- ChL Award
- International and national working groups
- Information and PR material in several languages
- Homepage www.chemicalleasing.com



Toolkit

- Provides a **systematic approach** to the implementation of Chemical Leasing business models at company level.

- Supports the planning, implementation and monitoring of Chemical Leasing projects by providing **templates, worksheets and other materials**



Sustainability Criteria



ChL business cases have to fulfil the following:

- Reduction of adverse impacts for environment, health, energy and resource consumption caused by chemicals and their application and production processes!
- Improved handling and storage of chemicals to prevent and minimize risks!
- No substitution of chemicals by substances with a higher risk!
- Economic and social benefits are generated; a contract should contain the objective of continuous improvements and should enable a fair and transparent sharing of the benefits between the partners!
- Monitoring of the improvements needs to be possible!

Global Chemical Leasing Award



→ The Award aims at enhancing the visibility of Chemical Leasing worldwide, encouraging innovative applications of the concept and recognizes best practices in Chemical Leasing implementation, publication and promotion activities.

The Award Ceremony will take place in June 2012 within the ACHEMA-Congress in Frankfurt, Germany. The application is open until: 15th April 2012

Four categories:

- o Case studies (companies)
- o Consulting services
- o Scientific publications
- o Public relations
(reports, homepage etc)



More information on:

www.chemicalleasing.com

Lessons learnt



Company level:

- Reduction in consumption of chemicals has to be achieved in a way that the amount and quality of *the final product is not influenced negatively*
- The suppliers of the chemicals must have *application-related know-how and willingness* to use this know-how to optimize the process
- As ChL requires an intensive cooperation and exchange of know-how between chemical users and suppliers → *trust is one of the major success factors*

International level:

- *Cooperation with other UN organizations* should be further strengthened
- *The international and national working groups* are valuable instruments to further promote the concept
- *Regional cooperation* facilitates replication of successful cases in neighboring countries
- Regular *exchange of information + experience* between different countries is important



a **S M A R T** business for green industry!

Technology innovation
Resource efficiency
Additional safety & health
Monetary benefits
Sustainable management





THANK YOU!

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→ Annexes

Case 3: Integrated painting process of washing machines



Country: Egypt
 Supplier: Akzo Nobel
 User: Delta Electrical Appliances
 Industrial process: Integrated painting process of washing machines
 Chemicals: Surface pre- treatment and powder coating chemicals



Surface Treatment

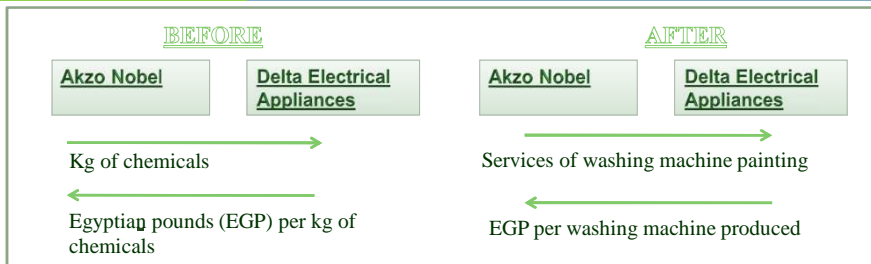


Electro-deposition Coating



Electro-static Powder Coating

Case 3: Integrated painting process of washing machines



- High production costs per washing machine
- Percentage of rework and rejects amounts to 9%
- 30 m³ of waste water are generated
- 10% of fine powder goes to waste
- No full compliance with REACH

UNDER ChL :

- Optimisation of the production processes incl. more efficient use in surface pre-treatment and electrostatic powder coating
- Minimisation of chemicals waste and recycling
- Improvement of working conditions and partnership between suppliers-users

Case 3: Benefits gained



Economic Benefits:

- Reduction of the total cost per washing machine by 15-20%
- Percentage of rework and rejects reduced to 1.5%
- Cost reduction of the production per unit

Environmental Benefits:

- Reduced consumption of pre-treatment chemicals by 15-20% and powder coating by 50%
- Elimination of sludge waste by using environmentally friendly pre-treatment process
- Reuse of waste water
- Recycling of waste

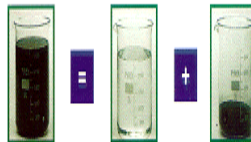
Social benefits:

- Training and capacity building for workers on sound chemicals management and chemical risks
- Compliance with the requirements of REACH

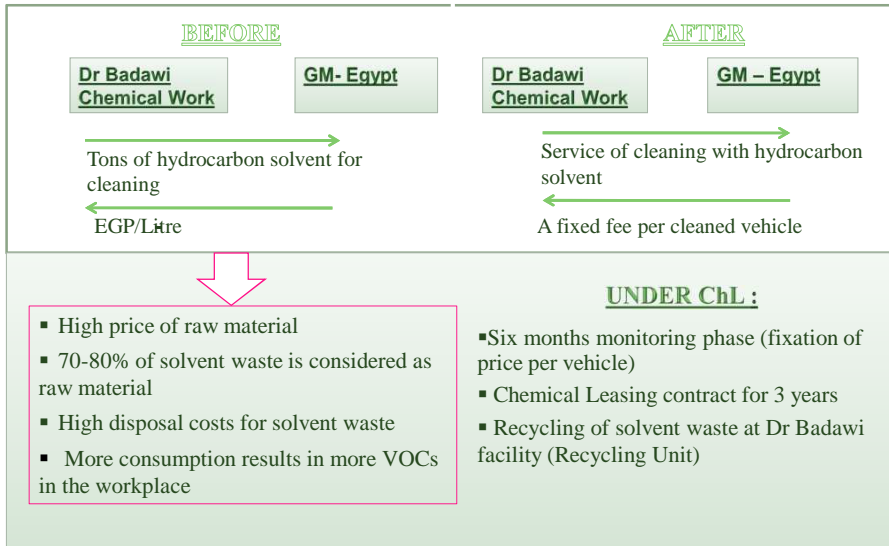
Case 4: Cleaning of equipment - car industry



Country	Egypt
Supplier:	Dr Badawi Chemical Work
User:	GM Egypt
Industrial process:	Cleaning of equipment
Chemicals:	Hydrocarbon Solvent



Case 4: Cleaning of equipment - car industry



Case 4: Benefits gained



Economic Benefits:

- Higher efficiency in cleaning process with hydrocarbon solvent by applying batch cleaning
- Reduction of solvent consumption from 1.5 L/vehicle to 0.85 L/ vehicle which leads to significant reduction in VOCs by 60%
- Cost reduction by 15% (saving of raw material due to recycling)
- Shared liability and benefits
- Long-term business relationship

Environmental Benefits:

- Better hazardous waste management in accordance with environmental regulations and international environmental corporate policy

Social benefits:

- Capacity building and high awareness of staff

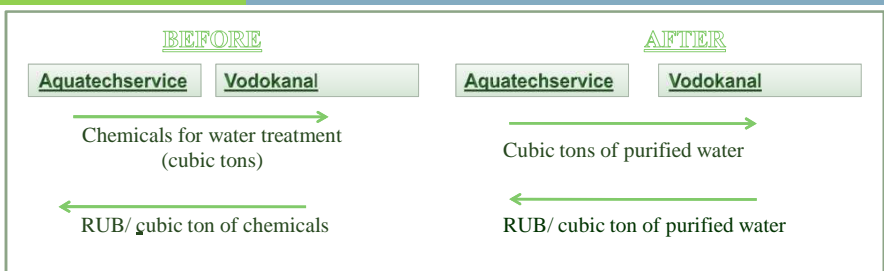
Case 5: Water treatment & disinfection



Country	Russia
Supplier:	Aquatechservice Ltd
User:	Vodokanal of St. Petersburg
Industrial process:	Water treatment and disinfection
Chemicals:	Chlorine → Sodium hypochlorite solution



Case 5: Water treatment & disinfection



UNDER ChL :

- Traditionally drinking water was disinfected with chlorine in St. Petersburg (extremely poisonous substance)
- Chlorine storage and transportation used to be a permanent source of potential accidents
- Production of sodium hypochlorite for water treatment from a 3% sodium chloride (NaCl) solution
- Replacement of hazardous chlorine by relatively safe sodium hypochlorite solution
- Participation of service companies in process optimization and equipment maintenance

Case 5: Benefits gained



Economic Benefits:

- Almost 33% reduction of water disinfection costs
- High reliability of the process
- Automatization of the process
- Reduced transportation costs

Environmental Benefits:

- Less transportation and storage risks due to utilization of NaCl.
- Improvement of the environmental situation in the North-West region of Russia
- In-situ production of sodium hypochlorite for water treatment

Social benefits:

- Improved occupational health and safety of employees

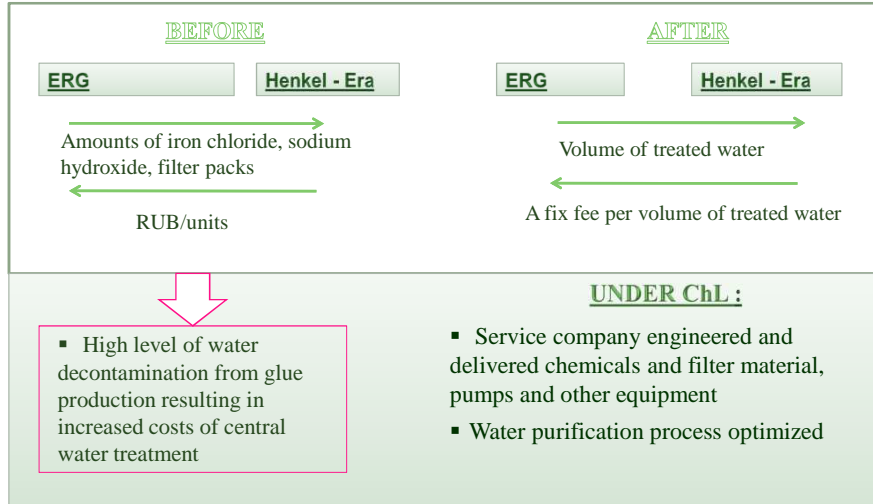
Case 6: Water purification



Country	Russia
Chemicals Supplier:	ERG
Chemicals User:	Henkel – ERA
Industrial Process:	Water purification
Chemicals:	Iron chloride, sodium hydroxide etc



Case 6: Water purification



Case 6: Benefits gained



Economic Benefits:

- Reduction from 880 RUB (about 35 USD) to 554.5 RUB (about 22.8 USD) per cubic meter of treated water
- Long-term business relationship

Environmental Benefits:

- Amount of environmentally hazardous chemicals used for wastewater treatment is significantly reduced

Organizational and social benefits:

- Added value (saved money) shared by HENKEL-ERA and ERG

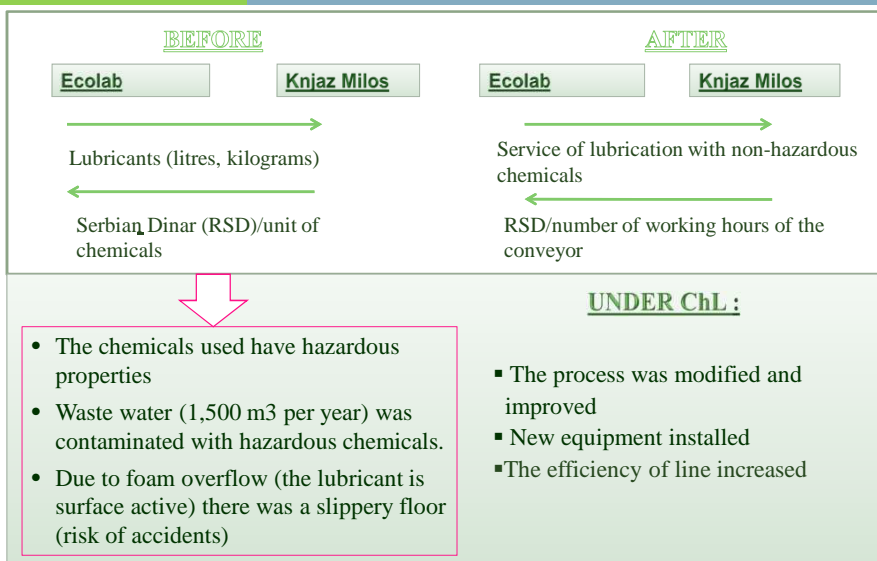
Case 7: Lubrication of conveyor



Country: Serbia
 Supplier: Ecolab
 User: Knjaz Milos
 Industrial process: Lubrication of conveyor
 Chemicals: Lubricants



Case 7: Lubrication of conveyor



Case 7: Benefits gained



Economic Benefits:

- Cost reduction for lubrication on the packaging line (which is the subject of the ChL contract)
- Better packaging line performance and therefore reduced handling costs
- Reduced costs for water consumption as in this process no water is being used

Environmental Benefits:

- Substitution of the hazardous chemical used for lubrication by an eco-friendly alternative
- Reduced consumption of the chemicals for water pre-treatment and waste water treatment at Knjaz Milos
- Reduced consumption of the chemical used for lubrication (by almost three times) due to modification of the process

Social benefits:

- Improvement of workers' health and safety

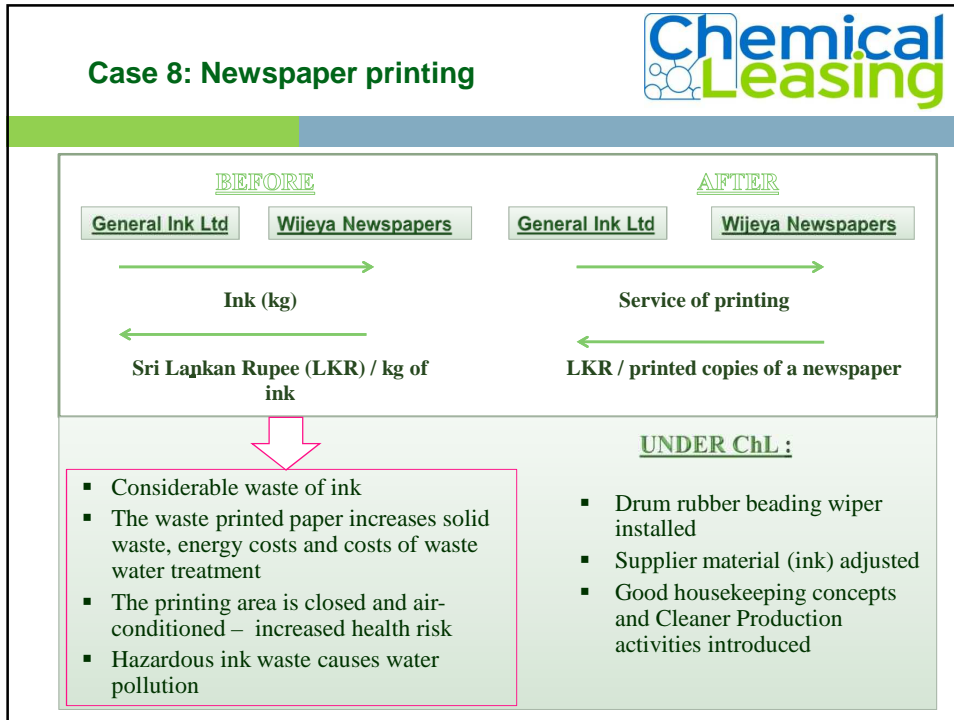
Case 8: Newspaper printing



Country	Sri Lanka
Supplier:	General Ink Ltd
User:	Wijeya Newspapers Ltd
Industrial process:	Newspapers printing
Chemicals:	Ink



Case 8: Newspaper printing



Feedback



"This concept demonstrates Ecolab's commitment to provide innovative solutions which make the production process easier, more efficient and safer. It helps us maintain our leading position"

Srdjan Jovic,
Sales Manager, Ecolab

"Overall we have achieved a win-win situation because, on the one hand, the performance of the line was improved, and on the other hand the consumption of chemicals was reduced, thus minimizing the impact on the environment without any negative effect on profit"

Ashraf El Wassify, Deputy of the General Manager, Akzo Nobel Powder Coating SAE

"Ecopetrol is convinced that Chemical Leasing is the best model to achieve the highest sustainable level of performance"

Orlando Cortés Tulando
Coordinator, Strategic Supply Unit, Ecopetrol

"By partnering with UNIDO on the Chemical Leasing project, we proved that it is possible to purify water with less chemicals. This resulted in both environmental and economic benefits. Some 4.5 million people as well as industrial customers are now getting purer water, and the new technology helps guarantee that there will be no accidents."

Karmazinov Feliks Vladimirovich
General Director of Vodokanal St. Petersburg

Two Level Strategy



- **National Level:**

To further disseminate ChL and to upscale ChL at national level and increase number of companies involved in ChL

- Sectors focus (including cluster/process based ChL models)
- Baseline studies for specific industrial sectors
- Synergies with other approaches to sound chemicals management
- Continue training and assessment activities
- Strengthen national working groups



Two Level Strategy



- **Global Level:**

To raise awareness and further disseminate information on the benefits of ChL and to encourage exchange of know-how and experiences

- Global ChL Awards
- Private-Public Partnership
- Global sector specific studies to outline potential for ChL
- International working group
- Partnership with other UN organizations (FAO, UNEP, etc.)



Energy assessments in relation to Chemical Leasing



- Classical benefits of Chemical Leasing:
Lower consumption of raw materials; reduced emissions and waste;
decreased risks
- In addition Chemical Leasing pilot cases have achieved significant energy savings and reduced CO2 emissions
- **Direct and indirect changes of energy consumption** need to be considered for energy assessments within the framework of Chemical Leasing

Energy assessments in relation to Chemical Leasing



Savings in DIRECT energy consumption

- Due to process optimization and improved technology
- Direct energy consumption is sometimes increased by Chemical Leasing, e.g. cleaning bath with higher temperatures to enhance the efficiency of chemicals

Savings in INDIRECT energy consumption

- Related to energy that is required to produce chemicals
- Savings due to decreased chemicals consumption and enhanced resource efficiency
→ less energy is consumed in the production process of chemicals
- Transport-related aspects may also be considered
- More complex calculation, if substitution has taken place

