THE BUSINESS MODEL CHEMICAL LEASING AS A TOOL
FOR PROCESS, ENVIRONMENTAL, AND OCCUPATIONAL
HEALTH AND SAFETY IMPROVEMENTS

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Abstract:

The future in chemical consumption, without any doubt, belongs to business models which involve intensive dialog, cooperation and pooling of the knowledge and experiences of users and producers. Sustainability goals of producers should include, among others, expansion of the sustainability of their products and services to customers to help them decrease their impacts on the environment. Chemical Leasing is a business model which includes these premises. It is a service-oriented business model that shifts the focus from increasing sales volume of chemicals towards a value-added approach. The producer mainly sells the functions performed by the chemical and the basis of payment is a functional unit instead of quantity or volume.

Model implementation leads to process, environmental and occupational health and safety improvements as well as to economical benefits for both parties. This model is also a very powerful marketing tool, as in today’s business world, which is characterized by turbulent changes in market relations, building new customer relationships rests on the development of new instruments and business models that will retain customers for a long period.

In this paper, the results obtained in the case study Knjaz Milos (beverage producer) and Ecolab (producer of chemicals) are presented. The model is implemented through the supply of chemicals for lubrication of the PET packaging line. The results obtained are lower consumption of resources, substitution of a hazardous chemical by an environmentally
friendly one, improvement of occupational health and safety; better packaging process efficiency and economic savings.

**Keywords:** Chemical Leasing, Sustainable Chemical Management, Business Model

### 1. Business Model Chemical Leasing

Chemicals are widely used in industry, from food processing to oil drilling. The risks of chemicals have been recognized and international initiatives have been undertaken to achieve their safe management.

Sound chemicals management also represents one of the objectives of the Implementation Plan of the World Summit on Sustainable Development held in Johannesburg in 2002, where 2020 was indicated as the deadline for the fulfilment of the set objective. Aimed at supporting countries to achieve the set objective, a Strategic Approach for International Chemicals Management (SAICM) was adopted on the International Conference on Chemicals Management held in Dubai in 2006. On that occasion, chemical leasing was promoted as one of the models for sustainable management of chemicals.

The functionality of a chemical is different in different industrial processes, depending on the conditions, environment, equipment and order of operations. It is clear that most users who employ chemicals in processes that are not their core business (e.g., surface protection of metal in the metalworking industry), have insufficient knowledge to optimize the processes in order to reduce the consumption of chemicals.

In the classical business model, the interest of producers is to sell as much as possible. The chemical leasing business model motivates them to optimize the consumption of chemicals.

In close cooperation with UNIDO and international working groups, Chemical Leasing is defined as a service-oriented business model that shifts the focus from increasing sales volume of chemicals towards a value-added approach. The producer mainly sells the functions performed by the chemical and functional units are the main basis for payment (for example - instead of volume or weight of chemicals, square meters of painted surface).
Within Chemical Leasing business models, the responsibility of the producer and service provider is extended and may include the management of the entire life cycle of a chemical. The relationship between a manufacturer and a user is based not only on the sale of chemicals, but also on the associated expertise (the manner and conditions of application, the concept of recycling and disposal). The manufacturer sells chemicals, including expertise for their effective use. In addition to users and producers of chemicals, a project may include optimization or modification of existing processes with the participation of equipment manufacturers, recycling companies and other interested parties (Fig. 1).

![Fig. 1 – Possible partners in chemical leasing business models (source BiPro)](image)

2. Case Study Knjaz Milos - Ecolab

2.1 Background

Knjaz Milos is the largest producer of mineral water and beverages in the Republic of Serbia and was founded in 1811. The annual production is about 220 million litres of mineral water and beverages, which is a third of the production in Serbia. Approximately 88% of mineral water production in Serbia is packed in PET bottles. All the companies have out-dated packaging lines, which means that the process of conveyor lubrication is based on wet lubrication with an extremely high consumption of water.
Ecolab is the world’s leading provider of cleaning, food safety and health protection products and services. Their sustainability goals include among others:
- Expansion of sustainability products and services to Ecolab customers to help them decrease their impact on the environment;
- Execution of a strategy that communicates sustainability progress and benefits into the interaction of Ecolab with customers

The Cleaner Production Centre of Serbia was established by UNIDO and Serbia is one of seven countries which are involved in a chemical leasing project.

2.2 Situation before Chemical Leasing

To ensure the smooth movement of the bottles down a packaging conveyor, the conveyor belt must be lubricated. Before Chemical Leasing, Knjaz Milos used a lubricant which was dissolved in water and sprayed onto the conveyor through nozzles (Fig. 2).

In order to prevent spills, a tray is installed beneath a conveyor (Fig. 3).

The chemical used as a lubricant has hazardous properties. It causes eye and skin irritation. In addition, it may cause long-term adverse effects in the aquatic environment.

Consumption of water and chemicals was measured during several months before implementation of the Project.
The annual consumption for the lubrication of one conveyor (which is now the subject of the Chemical Leasing contract) amounted to 6,000 kg of lubricant (calculated on 5000 working hours per year).

For water pre-treatment, sodium hypochlorite, which also has hazardous properties, was used. Every year, around 300 litres of sodium hypochlorite (14 %) were used for water pre-treatment on this packaging line. As the chemical had to be dissolved in water, wastewater (1,500 m³ per year) was contaminated with hazardous chemicals. Since the wastewater was treated in the public utility plant, information about the chemicals for wastewater treatment was not available.

The coefficient of friction was not uniform along the conveyor which was the reason for bottles falling and down time. The operator attempted to solve the problem by lubricant overdosing, which resulted in foam formation and the overflow of the tray.

2.3 Changes due to the implementation of Chemical Leasing

ECOLAB offered an integrated solution for the above-mentioned problems. By purchasing equipment, product and service (ChL model B – Fig. 1), Ecolab implemented in this case an innovative solution for the lubrication of the PET packaging lines and eliminated many problems related to wet lubrication. The process is completely under the control of Ecolab, as adjustments may be undertaken only by authorized persons from Ecolab.

The process was modified and the chemical was substituted by a non-hazardous one (according to the Material Safety Data Sheet, no significant effects or critical hazards to human health are known and no information on ecotoxicity is available). In addition, new equipment was installed (Fig. 1 – ChL model B).

The unit of payment is according to the role of this chemical NUMBER OF WORKING HOURS OF THE CONVEYOR. The equipment has a built in - controller (counter) – Fig. 4., which registers the working time; hence, there is objective data for the agreed unit of payment.
2.4 Situation after the implementation of Chemical Leasing

2.4.1 Process improvement

On process modification, the coefficient of friction of the transportation band was lower and more uniform (Fig. 4).

As the result, the efficiency of the line has been increased (which is one of the key performance indicators in Knjaz Milos) and the working life of the conveyor has been significantly extended. The downtime, which was about 15 minutes per shift before the implementation of the ChL model, has been eliminated. This fact is very important in high season when the company works seven days a week in two shifts.

Microbiological problems are reduced since water is not in use and the new lubricant has a microbistatic effect (prevents the growth of microorganisms).

Time and costs for cleaning and disinfection of the conveyor are reduced.
2.4.2 Environmental improvements

While a Chemical Leasing model is focused on reducing the consumption of chemicals, the result is a reduction in the use of other resources. In this case, for the packaging line that is the subject of the contract:

- Water is not used for the lubrication process (consumption will be reduced by 1500 m³ yearly);
- Sodium hypochlorite is not used for water pre-treatment (consumption of active chlorine will be reduced by 7.5 kg yearly, which means about 300 l of sodium hypochlorite);
- Consumption of chemicals for waste water treatment will be reduced (cannot be quantified as waste water treatment is realized by the Public Utility);
- The lubrication chemical with dangerous characteristics is replaced with an eco friendly one;
- Consumption of the chemical for the lubrication is three times lower than before the implementation of the ChL model.

Even though there are some energy savings (electricity) that are negligible (there is no water pumping, spraying time and the coefficient of friction is reduced).

2.4.3 Occupational health and safety improvements

An important advantage of lubrication without the employment of water is improvement of the working conditions and occupational health and safety:

- Reduced quantity of aerosols in the air;
- There are no contacts of workers with chemicals:
- Cleaner working environment;
- Risk of injuries is significantly reduced, as the floor is not slippery (Fig. 7).
3. Economic savings for Knjaz Milos

In addition to these improvements, the implementation of the ChL business model has brought significant cost savings to Knjaz Milos. In Figure 8 are shown the direct savings, which do not include the reduced time and cost of cleaning and disinfection of the line, the costs of downtime and intervention on the line (about 15 minutes per shift) and the reduced costs due to the increased working life of the conveyor. It is also important that a part of the packaging costs is completely predictable and can be precisely calculated per unit.
4. The benefits for Ecolab

Maintenance of the lubrication system is the responsibility of Ecolab. Their interest is to spend as little as possible lubricant to achieve good working characteristics of the transporter. The benefits are:

- Transportation costs of lubricant is three times lower, as the imported quantity is lower;
- Cost for storage hiring is lower;
- Services are a part of the product price;
- Better relationship with Knjaz Milos;
- Threat from competitors is significantly reduced (before ChL model implementation, Knjaz Milos had two suppliers of lubricant for this line).

This concept demonstrates commitment of Ecolab to provide innovative solutions which make the production process easier, more efficient and safer. It helps them to maintain their leading position.

6. Possibility of multiplication

Knjaz Milos intends to implement the model on the other lines since the expectations related to chemical consumption, increased productivity, better working environment and lower costs are fulfilled. They expect to improve further their operations, build trust with Ecolab and to concentrate on the core business.

The possibility of implementation of the model is very high in the beverage industry, as well as in beer production and dairies.

7. Conclusions

Key factors in the success of the implementation of the model are fair share of benefits, high quality standards and mutual trust of the participants.

One of the management principles, according to Quality Management Systems ISO 9000, is “Mutually beneficial supplier relationships”. According to ISO 9004:2009
a. Key benefits for partners are:

- increased ability to create value for both parties;
- flexibility and speed of joint responses to changing market or customer needs and expectations;
- optimization of costs and resources.

b. Applying the principle of mutually beneficial supplier relationships typically leads to

- establishment of relationships that balance short-term gains with long-term considerations;
- pooling of expertise and resources with partners;
- identification and selection of key suppliers;
- clear and open communication;
- sharing information and future plans;
- establishment of joint development and improvement activities;
- inspiring, encouraging and recognizing improvements and achievements by suppliers.

The application of the chemical leasing business model is an outstanding example of all these advantages that partnerships between users and suppliers bring.

References

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