

# Chemical Leasing of solvents – a sustainable approach for metal cleaning

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## Abstract

High quality solvent cleaning is indispensable for human progress especially in applications for peoples' safety and security. Effective Risk Management enables the sustainable use of chlorinated solvents. SAFECEM has implemented innovative business models like Chemical Leasing which enable industry to maintain the required surface cleaning quality. By combining best practice Risk Management with continuous process optimization, Chemical Leasing leads to a significant increase of customer satisfaction and solvent efficiency with virtually no emissions.

## Keywords

*Chemical Leasing, Risk Management, Process Optimization, Chemical Products Services (CPS), Sustainable Metal Cleaning*

## 1. Introduction

Following the company's mission "We are The Service Company responsible for the sustainable and innovative use of chemicals", SAFECEM Europe GmbH, a global business unit of The Dow Chemical Company, has since its foundation been focusing on providing solutions for industrial surface cleaning with solvents to more than 6,500 customers. For this SAFECEM followed the Cradle to Cradle philosophy (see for example McDonough, W., Braungart, M., 2009) to improve product and application sustainability. The SAFECEM business model is seen as a recognized example for the implementation of Dow's 2015 sustainability goals. Over the years, working towards the goal to provide the safe and efficient use of cleaning chemicals, more and more service offerings were developed and partnerships and cooperation with major cleaning equipment producers established.

SAFECHEM naturally became a pioneer in the development and constant improvement of Chemical Product Service business models for surface cleaning in many industry segments.

High quality solvent cleaning is indispensable for human progress especially in applications for peoples' safety and security such as aeronautic and automotive industry, measuring instruments, safety components, and surgical instruments. Effective Risk Management enables the sustainable use of chlorinated solvents in these applications and consists of three major elements:

- Use of solvents in closed cleaning equipment
- Storage, transport and handling in closed loop safety systems
- Training and application know-how from experts along the entire supply chain:

[www.chemaware.org](http://www.chemaware.org)

Every solvent has product specific risks and there are always two options: substitution or implementing the tools and measures for effective Risk Management. Substitution is recognized as a best practice as long as the alternative offers at least the same quality parameters and is not inferior from a technical performance perspective. If substitution means accepting a second best alternative, it becomes short-sighted vis-à-vis progress. An effective Risk Management strategy can be measured by combining compliance with emission levels on one hand and sustainability criteria - environmental, economic, and social benefits - on the other.

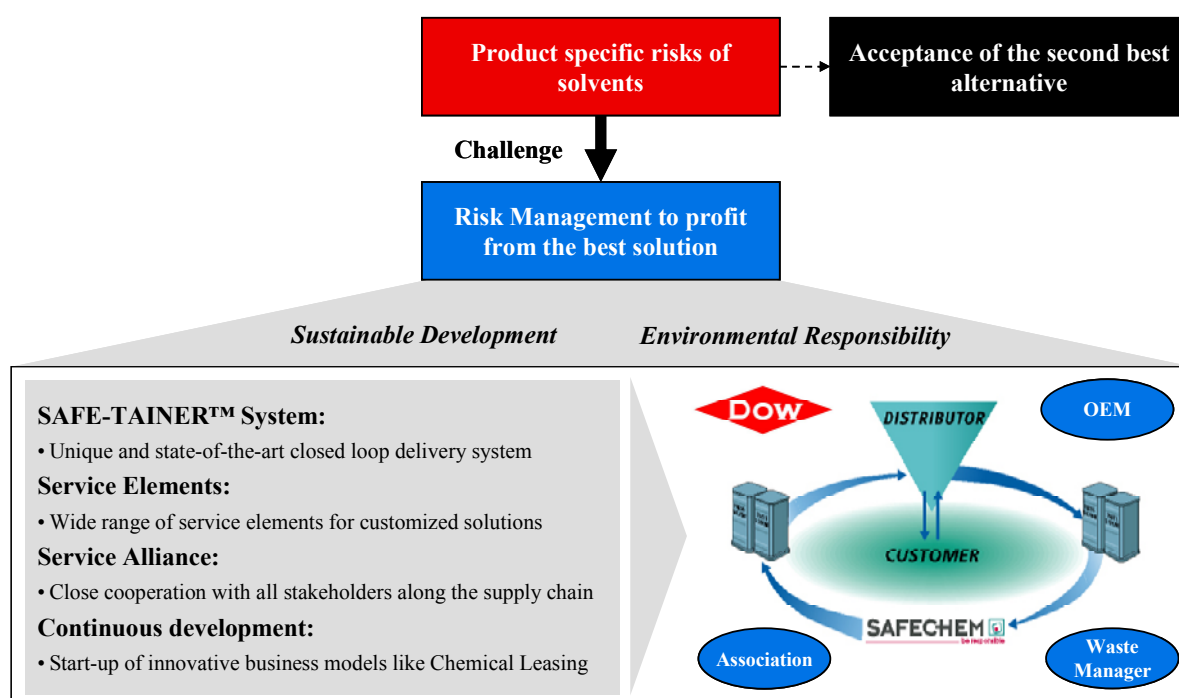


Figure 1: Risk Management in a Cradle to Cradle Business Model

The results of a best practice Risk Management strategy in industrial surface cleaning include virtually no solvent emissions and a significant increase in the lifespan of the product. Additionally, the solvent virtually does not come in contact with workers or users. SAFECHM is implementing best practice Risk Management with the SAFE-TAINER™ system which is a unique state-of-the-art closed loop delivery system combined with a wide range of service elements for customized solutions. SAFECHM cooperates in a Service Alliance with all stakeholders along the supply chain including the leading and responsible chemical distributors, the majority of technology leaders for regulatory-compliant cleaning equipment and a group of leading certified waste management companies. Committed to continuous development SAFECHM has implemented innovative business models like Chemical Leasing which enable a further increase of solvent efficiency and customer satisfaction.

A technical report from the Institute for Prospective Technological Studies, European Commission, Directorate General, Joint Research Centre analyzed the increased solvent efficiency by implementing Chemical Product Services (see Kortman, J., Theodori, D., van Ewijk, H. et al., 2006). With open machine technology 754 kg of solvent was needed to remove 100 kg of oil. Air emissions accounted for 520 kg and 233 kg went into the waste stream. The introduction of closed cleaning equipment which complies with the European VOC directive reduced the solvent input to 160 kg with significantly reduced air emissions of 10 kg and 150 kg of solvent in the waste stream. Changing the business model to Chemical Product Services enables a further significant reduction of the solvent input to 15 kg through process optimization by regular solvent monitoring and re-stabilization which reduces the solvent in the waste stream to 5 kg.



**Amounts per 100 kg oil removed**

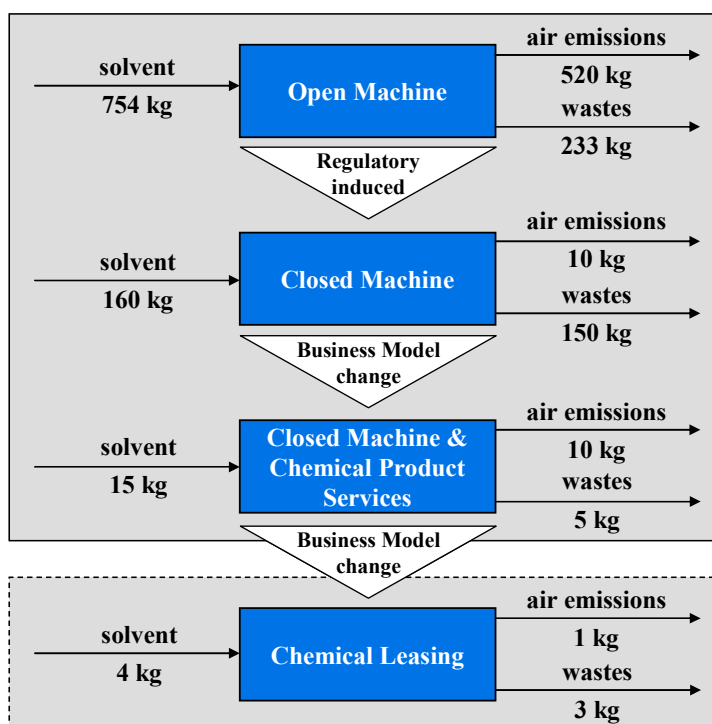


Figure 2: Chemical Product Services increase solvent efficiency

Latest experiences show that changing the business model to Chemical Leasing enables a further reduction of the solvent input to just 4 kg which represents an overall reduction of 99,5%. This is possible due to the introduction of further optimized cleaning equipment operated within the Chemical Leasing setup which reduces air emissions to 1 kg combined with enhanced know-how pooling to optimize the cleaning process which reduces the solvent in the waste stream to 3 kg.

Within this Chemical Leasing business model the solvents are an integral part of the full service package and the performance is sold. The chemicals are “leased” to the client and invoicing is based on a cleaning performance parameter such as number of cleaned parts or life-time of the solvent. As illustrated above the enhanced know-how pooling within the Service Alliance amongst SAFECHEM and the machine producers enables an optimized cleaning process. While conflicting incentives are dominating traditional product supply relationships where the supplier wants to increase and the buyer wants to decrease volumes of chemicals, Chemical Leasing models are able to align the incentives. Since the service provider is paid for the performance of the chemical, the volume of chemicals becomes a cost factor for him. And both parties target to decrease the lifecycle costs.

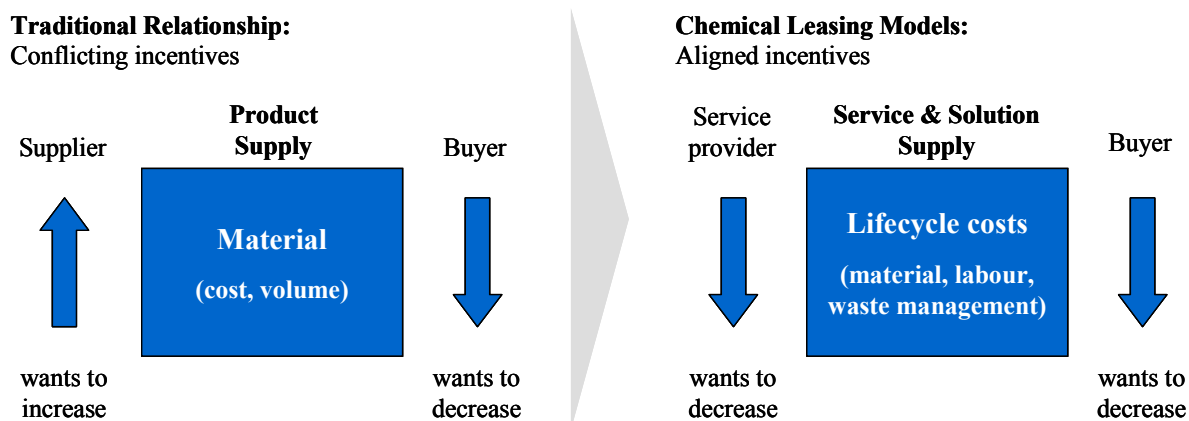


Figure 3: Chemical Leasing – The complete cleaning solution from experts (see for example SAFECHEM Europe GmbH, 2008)

The Chemical Leasing business model is supporting global compliance since many legal requirements of REACH as well as the overall target of SAICM are supported by the principles of this business model. REACH requires information exchange and intensive communication and Chemical Leasing is based on the enhanced know-how pooling of all partners. REACH promotes guide lines for cooperation and sharing of costs and Chemical Leasing implements sharing of efficiency improvements and savings. REACH is based on the Precautionary Principle and Risk Management and Chemical Leasing enables the sustainable efficiency optimization of chemicals. Finally REACH defines rules for documentation and regulatory control and Chemical Leasing requires the measurement and control of the use of chemicals.

REACH	Chemical Leasing
<b>Legal Requirements</b>	<b>Principles of the Business Model</b>
<ul style="list-style-type: none"> <li>• Information exchange and intensive communication</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced know-how pooling of all partners</li> </ul>
<ul style="list-style-type: none"> <li>• Guidelines for cooperation and sharing of costs</li> </ul>	<ul style="list-style-type: none"> <li>• Sharing of efficiency improvements and savings</li> </ul>
<ul style="list-style-type: none"> <li>• Precautionary Principle and Risk Management</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable efficiency optimization of chemicals</li> </ul>
<ul style="list-style-type: none"> <li>• Rules for documentation and regulatory control</li> </ul>	<ul style="list-style-type: none"> <li>• Measurement and control of the use of chemicals</li> </ul>

Figure 4: Chemical Leasing – Supporting global compliance (REACH)

The overall target of SAICM is the production and use of chemicals in ways that minimize significant adverse impacts on the environment and human health. Chemical Leasing is based on the responsible production and use of chemicals, on risk reduction for the environment and mankind, and on innovation which leads to improved competitiveness.

SAICM	Chemical Leasing
<ul style="list-style-type: none"> <li>• Production and use of chemicals in ways that minimize significant adverse impacts on the environment and human health</li> </ul>	<ul style="list-style-type: none"> <li>• Responsible production <u>and use</u> of chemicals</li> <li>• Risk reduction for the environment and mankind</li> <li>• Innovation leads to improved competitiveness</li> </ul>

Figure 5: Chemical Leasing – Supporting global compliance (SAICM)

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