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Centro Mexicano para la Producción más Limpia

FINAL REPORT

**PROMOTION AND IMPLEMENTATION OF "CLOSING THE LOOPS"
COOPERATION AND BUSINESS MODELS IN THE CHEMICAL
INDUSTRY**

CHEMICAL LEASING

**Project No. UE/INT/06/003
Contract No. 16001472**

November, 2008

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1. STATUS OF CHEMICAL LEASING

Since 2005, the Mexican Center for Cleaner Production (Centro Mexicano para la Producción Más Limpia) has developed various activities to disseminate and implement the Chemical Leasing model in the country.

To date, at least 92 companies have been attended, ranging from micro-companies to multinationals like Coca Cola, Bimbo and Grupo Modelo. Sectors covered include petrochemicals, galvanoplasty, sugar mills and lubricants, to name just a few.

The implementation of the model considers performing activities such as: telephone calls, presentation of the model, plant visits to detect the chemicals appropriate for the model, meetings in different companies, etc.

The following table presents the list of activities performed since 2006.

ACTIVITY	2006	2007	2008
Companies contacted	8	41	33
Calls	75	205	125
E-mail	54	137	92
Presentation of model	26	86	28
Meetings	42	96	22
Visit for detecting chemicals for the model	5	25	28
Agreement signed	1	2	0
Contract signed	1	1	0
Visit for implementation	17	32	0
Days for implementation	69	82	0
Letter of intent	-	-	3

It should be indicated that, in order for us to be seen by the person who has the decision-making power for implementing the model in the company, we have to hold more than 4 meetings with different people in the company.

Also, we have faced the situation where the decision can only be made by the corporate management, such as is the case with Bimbo or Coca-Cola, and this took several days, because the executives are sometimes abroad.

The Chemical Leasing model has been disseminated through 8 forums, both in Mexico City and within the Republic, with the participation of businesspeople, industry chambers, and governmental and educational organizations.

The number of companies attending the forums, as well as the place where they were held, are presented below:

FORUM	YEAR	COMPANIES	PLACE
1	2005	6	México D.F.
2	2005	12	León, Guanajuato
3	2007	12	México D.F.
4	2007	10	México D.F.
5	2008	20	ANIPAC
6	2008	35	EUROCHEM
7	2008	4	SEMARNAT
8	2008	42	ANIQ

To date, the signature of three cooperation agreements has been achieved.

YEAR	COMPANY 1	COMPANY 2	SECTOR	CHEMICALS
2006	CRODEL	MARDI	Electroplating	Brighteners
2007	PEMEX	ARKEMA	Petrochemical	Catalysts (peroxides)
2007	San Cristobal Sugar Mill	Chemical Mac Oil	Sugar mill	Lubricant (oil and greases)

Although the number of companies that signed cooperation agreements is low, the experience obtained by the CMPL in the review of diverse processes is high, and allows us to perform the implementation of the model in any company and sector.

DEVELOPMENT IN 2008

In the course of 2008, the Chemical Leasing model has been presented in person to 33 companies, that is, meetings were held in the company and plant tours took place to evaluate the process and chemicals used, in order to identify the area of opportunity for the implementation of the model, as well as possible indicators of payment for productivity.

With the above, on average we have visited 3 companies per month (from November 2007 to September 2008). The following table contains the list of companies that were considered, as well as the area of opportunity where the unit of payment can be defined.

COMPANY	Chemical Leasing Opportunities
Crown Envases de México	Metallic container labeling
Comercial Roshfrans	Filters and lubricants
Qualamex	Pasteurization treatment
Graficas la Prensa	Cleaning of plates with solvents
Helvex	Cutting oil
Grupo Bimbo	Lubricants for transportation fleet
Grupo Modelo	Treatment of process water and services
FEMSA Coca-Cola	Bottle cleaning
Henkel	Application of painted products
Akzon Nobel	Application of products of electrostatic paint
DOW Chemical	Supplier of chemical products for diverse sectors
BASF	Supplier of chemical products for diverse sectors
QUIMIC	Supplier of chemical products for diverse sectors
ALKEMIN	Supplier of chemical products for the mining sector
Minera Autlan	Floculants
EUROCHEM	Supplier of chemical products for diverse sectors
C&T Technology	Activated charcoal
PEPSI Bottling Group	Bottle cleaning and lubrication of rollers on transporting tables
NESTLE	Water treatment
JUMEX	Container labeling
BACARDI	Cleaning of containers and water treatment
AKIM	Supplier of products for galvanoplasty and disencrustant
ICROMA	Finishing of metallic pieces in electrolytic baths
ROTOPLAS	Chemicals used in the manufacture of tanks and cisterns
PLATAFORMA PEMEX	Disencrustants for handling seawater in toilets, reverse osmosis plant
HIDROMEX	Painted trucks and safes
OWENS CORNING	Adhesive applied to fiberglass in the preparation of thermal insulation
MARÍTIMA DE ECOLOGÍA	Corrosion inhibitor for crude processing lines
TRANSCONTINENTAL	Only presents areas of opportunity for P+L and good operational practices
FIRESTONE	Chemicals for rubber manufacture
ALIMENTOS EFA	Chemical products in boilers
LOREAL	Chemical products used in cosmetics manufacture

In addition, 4 forums have been held with industry representatives, educational institutions, industry associations and government to disseminate the Chemical Leasing business model, which in total have represented 101 interested parties.

The associations where the model has been presented are: ANIPAC (National Plastic Enterprises Association), ANIQ (National Chemical Industry Association), IPN (National

Polytechnic Institute), PROFEPA (Federal Environmental Protection Agency), SEMARNAT (Mexican Environment Ministry) and ONUDI Mexico; nevertheless, even though it appears to be a model that is of interest to all of them, no cooperation agreement and contract has been established in terms of Chemical Leasing, due to:

- A. Working with government companies is very difficult, because of factors such as: tenders for the acquisition of chemical products, alternating operational and downtime periods, requirement for expensive equipment that often neither the user nor supplier want to pay for; despite this, Chemical Leasing is interesting, but the suppliers do not trust using a payment for productivity indicator, because *government companies do not allow suppliers to come to work on their processes.*
- B. Working with small companies can bring problems such as: lack of experience in the handling or application of the chemical product, not having the technical and production capability to fulfill the requirements that users of medium or large companies require, a lot of time invested for achieving the implementation of the model, among others, that do not always augur satisfactory implementation.
- C. The corporate headquarters establish their strategy and selection of products to acquire in the different plants under the agreements defined by the Management group or the Shareholding Partners. In this regard, the plants do not have the autonomy to select the supplier with whom they want to operate. This requires a greater number of meetings in order for the information to arrive at the Management group and for it to adopt the model for implementation in the different plants.
- D. Contacting the decision makers within the corporate headquarters (mainly large companies) is not easy, and the initial contacts regularly occur with the heads of production departments or sub-divisions, which entails at least 3 or 4 meetings (approximately 1 month) for presenting the model to the right person, without this meaning that it is accepted.

2. PROJECTS UNDERWAY

2.1 HIDROMEX

Company dedicated to the manufacture of dump truck chassis and hydraulic equipment, armored units for transfer of valuables and safes, as well as public transport units (minibuses).



Once its products are manufactured, they are sent to a painting booth, where the coating is done by hand by its staff (metalworkers and painters). This method of applying the paint requires considerable time, handling of solvents that put the health of their staff and the environment at risk, as well as waste of raw materials.

The implementation of the project will consider optimizing the painting process and, if possible, a change in the types and qualities of solvents, in order to use environmentally friendly products, combined with a re-engineering proposal for the painting booths so that they have insulation from the outside, extraction systems and air emissions control equipment.

The payment units that have been considered are: per unit of area painted, per unit (minibus, dump truck), per safe.

In 2007, the Hidromex company manufactured:

PRODUCT	PIECES
Dump truck boxes of 7 m ³	701
Dump truck boxes of 14 m ³	400
Minibus	274
Safes	500
Security Door	50

Which required 79 m³ of paint and 85 m³ of solvents, which represents a total cost of \$4,775,940 Mexican pesos.

The process creates paint and additive waste, impregnated metallic containers and fluids that created an expense for disposal for Hidromex of \$60,000 Mexican pesos.



The supplier of the chemical products is the Sherwin Williams company, and a meeting is being sought with its representatives in order to present the business model. From the supplier, a technical service proposal shall be requested and a redesign of the booths and painting equipment will be sought

The Executive Director of Hidromex will sign the letter of intent which indicates the interest he has in implementing Chemical Leasing.

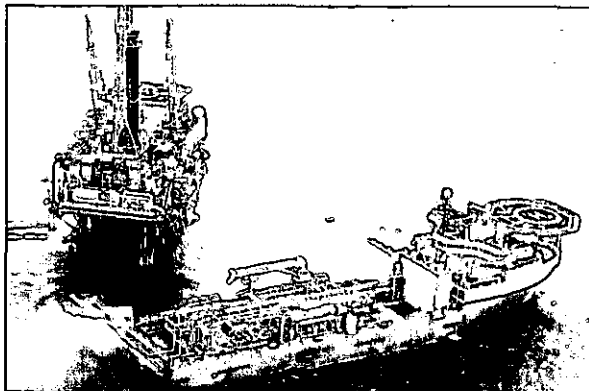


Contact: Engineer Alfredo Perez Pimentel
Environmental, Safety and Health Manager

Web: <http://www.hidromex.com.mx/hidromex/>

2.2 MARECSA

The company provides assistance to PEMEX on the offshore rigs (oil wells) for gauging activities, cleaning, repair and stimulation, in order to catch all the fluids (chemical products, crude, gas and formation water) for separation and reincorporating the oil to PEMEX wells.



The MARECSA process operates on a dynamic positioning ship for complying with the PEMEX requirements and other national and foreign regulations.

The flow originating from the well passes to a throttle, to regulate the pressure and entry flow of the current, then it goes through a filtering system for retaining silt and other impurities. At this point, chemical products are added (de-emulsifiers, de-foamers, corrosion inhibitors, asphaltene controller, among others) that have the purpose of making the separation processes more efficient and preventing excessive wear of the equipment and the process lines.

The Director of MARECSA, Mr. Gabriel Delgado, showed interest in the project, signing the letter of intent.

The Chemical Leasing team made a visit to Ciudad del Carmen, Campeche (where the offices are located) to present the model and go aboard one of the ships that is operating in Campeche Sound, Gulf of Mexico; there, the process was reviewed and the chemicals susceptible to implementation were identified.

Currently, the information referring to the registry of consumption of chemical products is being reviewed by type of service to the well and a balance of crude processed and oily waters, in order to calculate the payment unit.

Next, we will have a meeting with the Química APOLO company, which is the supplier of chemical products, in order to present the model to them and establish actions and commitments for implementation. Within the elements for evaluating the efficiency of the chemical product, tentatively measuring tests of thickness in tubes will be conducted in order to evaluate the efficiency of the chemical product, among other parameters that refer to the number and level of corrective and preventive maintenance on equipment and accessories.



Contact: Eng./PhD. Gabriel Delgado Saldivar

Web: <http://www.marecsa.com>

2.3 SEMARNAT

The Secretary of the Environment and Natural Resources (SEMARNAT) was presented with the Chemical Leasing model and the advantages of its implementation. In this regard, and in support of the sartorial programs that the secretary has, it was decided to perform the implementation of the model with companies from the state of Guanajuato derived from the development of the Shoe and Leather industry, because the sector consumes a large amount of chemical products. The intent is to start the implementation of the model in the FLEXI and EMICO companies (both shoe manufacturers) with chemical products made by the Henkel company.

In addition, a forum will be organized with the national tannery industry (CANALCUR) so that the companies in this sector join the adoption of the Chemical Leasing model and the responsible use of chemical products, such as chromium (IV), which cause an important environmental impact on effluents.

The working group for disseminating the implementation of the model among Guanajuato companies is made up of the CMPL, SEMARNAT and ONUDI Mexico.

The SEMARNAT has approached the aforementioned companies, which have ratified their interest with respect to the model and consider initiating the implementation with the use of glues.

The SEMARNAT has indicated its interest in the project and has signed the letter of intent.

Among the activities to carry out with the companies to be visited are:

- Review of the process and identification of areas of opportunity.
- Technical proposals for implementation.
- Work plans.
- Structure of cooperation agreements.



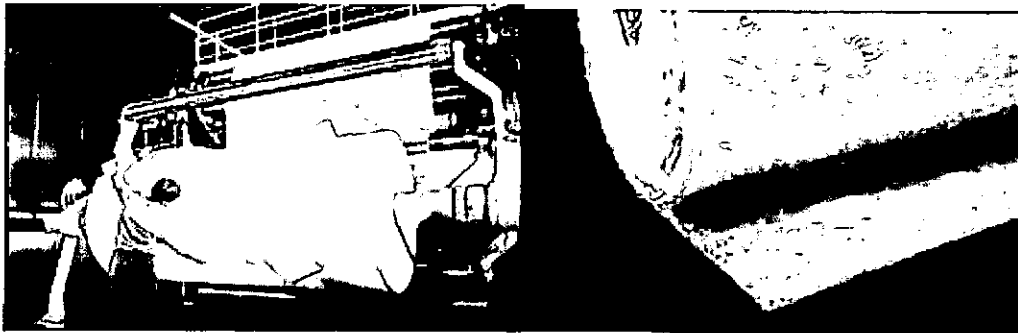
Contact: MSc. Ana Maria Contreras
MSc. Maricruz Gallegos

Web: <http://www.semarnat.gob.mx/Pages/inicio.aspx>

2.4 OWENS CORNING

Owens Corning is a American company that works on the manufacture of fiberglass to reinforce plastics and thermoacoustic insulation.

One of the most important product applications is Veils and Specialty Non-Wovens. The products are made from randomly dispersed glass fibers, wet laid and bonded into a thin sheet, and are used in multiple applications in different industries. In the building industry, the products are used to reinforce faced acoustical ceiling panels as well as to reinforce flooring, insulation, gypsum and exterior materials.



Basically in Mexico, Owens Corning develops:

Panel Facer: For acoustical and thermal insulation paneled ceilings are faced with a Veil that increases panel stiffness and resists puncturing. Veils are also combined with materials such as polyurethane (PUR), polyisocyanurate (PIR), phenolic and polystyrene foam to produce complete thermal insulation systems used on roof panels, external cladding panels and cavity walls.

Three visits were made to the company. The first visit was used to present it with the model and its benefits. Then, a tour was made for the entire process to identify areas of opportunity and chemical products susceptible to implementation of the model.

Within the areas for implementation is the application of adhesives on fiberglass in order to place a coating material.

The adhesive application has several problems, including poor atomization of the glue on the fiberglass (they have basic nozzle system for applying it on the sheets); another is poor alignment between the fiberglass roll and the sheets, so when the production system starts, a large quantity of materials is lost.

Current supplier: National Starch & Chemicals www.nationalstarch.com, National Adhesives www.nationaladh.com

Possible Payment Index: \$ by square meter of fiberglass cover on the sheets

The last meeting had participation of personnel of the ONUDI and the international expert, as well as the CMPL work team, in order to confirm the area of opportunity and give suggestions for implementation to the company staff.

As activities being developed, an analysis is being made of information sent by OWENS in order to establish the current situation and structure performance indicators that allow for structuring the approximate amount in the payment by productivity indicator.

The positive response of the adhesives supplier is expected in order for it to be integrated into the business and submit a technical proposal in accordance with providing an integrated service that considers elements such as: optimization of the adhesive application system, reduction of poorly used raw materials (starting with a correct system of alignment of rolls of fiberglass and rolls of coating), reducing operating times and downtime for maintenance.

Once the technical proposal is made, a cooperation agreement will be structured between the three involved parties, following the implementation of the model in an established work plan.



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3. INTERNATIONAL ACTIVITIES

3.1 COLOMBIA

Given the experience that the Mexican Center for Cleaner Production has obtained in the Chemical Leasing project, the National Cleaner Production Center of Colombia extended an invitation to participate in the project launch in Colombia.

From August 19 to 25, the First Chemical Leasing Workshop was carried out, with the CMPL acting as exhibitor in this event, which took place in three Colombian cities: Bogota, Medellín and Cali, meeting with 92 companies from different sectors.

As part of the support that the Mexican Center for Cleaner Production provided the National Cleaner Production Center of Colombia, it also made technical visits to 5 companies interested in the application of Chemical Leasing: Grival, Mazdel, General Motors, Roy Alpha and Interquim.

The results of the technical visits are:

1. Grival: NCPC will schedule a second visit in September in order to present the ChL model to the heads of the different areas related to galvanic and wastewater treatment. The company will define its partner provider now.
2. Mazdel: This company has signed the letter of intent and NCPC will contact the partner provider suggested for this case.
3. General Motors: This company has a chemical leasing system almost developed already with the provider Colpisa SA. NCPC will make a contact with them in order to try to establish a new unit of payment.
4. Roy Alpha: This enterprise is very familiar with the concept of ChL because it was the first company visited at the beginning of this year. They still want to find the appropriate partner provider to establish new production models that optimize the anodizing plant.
5. Interquim: This is an Akzo Nobel company and they are very interested in exploring new business models in the Formaldehyde plant. NCPC will contact its main provider in order to propose the ChL model.

In order to provide support to the new members of the project, the Mexican Cleaner Production Center is developing an 8-hour course-workshop to provide detail on the stages for implementation of the model, based on the lessons learned over three years. This workshop has two practical exercises on galvanoplasty and sugar mills so that the participant not only knows the model and its benefits, but also works on the stages that the Mexican Cleaner Production Center develops up to the signing of the contract.

3.2 DAKAR

In order to present the model in international congresses, the Mexican Cleaner Production Center participated in the VI Intergovernmental Forum on Chemical Safety

(IFCS), with the speech titled "Chemical Leasing Business Model: a strategic proposal for the sustainable chemical handling."

The event was organized by the Government of Dakar, from September 15 -19, 2008. The purpose of the Forum was the sustainable handling of chemicals at an international level for 2020. Other objectives were to increase awareness and to debate the advantage of substitution of chemicals, to analyze possible mechanisms of initiation and activation of the substitution processes, with the inclusion of analytical instruments which fortify the project and to determine the ways and methods for substitution.

In addition, we participated in the "International Working Group on Chemical Leasing," where we acted as moderators of the Side Event, presenting the status of the results obtained from the project in Mexico and companies that are in the process of implementing the model. The meeting was attended by 25 participants, who were presented with the Chemical Leasing model and who recognized the economic and environmental benefits that its implementation entails.

Some conclusions that we can indicate are:

- 1) The Chemical Leasing business model has proven to promote the sustainable production and consumption of chemicals.
- 2) Promotion of Chemical Leasing through governments reduces the required time for the implementation of the model.
- 3) The support of international organizations has been critical for the dissemination of the concept.
- 4) There is a risk in the implementation of Chemical Leasing, specifically when hazardous chemicals are involved.
- 5) Chemical Leasing helps SAICM objectives
- 6) Chemical Leasing is an excellent tool for marketing and competitiveness and promotes productivity schemes.

3.3 MOROCCO

The director of the CMP+L, Dr. Jorge Pérez and the international expert Dr. Reinhard Joas will travel to Casablanca, Morocco, to present the experiences that the CMP+L has had during the development of the project; two companies were visited:

CETIA

Sector: Food

Contact: M. Hassan EL CADI

Web page: www.cetia.ma

A visit to the process was made to identify areas of opportunity for the implementation of Chemical Leasing, considering the benefits of holding a forum with the Morocco food industry.

SMAGHREB STEEL

Sector: Galvanized

Contact: Hanane EL GUINOUI

Web page: www.maghrebsteel.ma

A plant tour was conducted, identifying the painting of metallic pieces and elements in the eletro deposits of pieces as an area of opportunity, considering the experience of galvanoplasty obtained in Mexico.

4. FUTURE TASKS

- The Chemical Leasing team of the Mexican Cleaner Production Center considers that this project has potential, therefore it will be promoted as part of the services that we offer.
- The Chemical Leasing team will continue to work with the MARECSA, HIDROMEX, OWENS CORNING and SEMARNAT projects in order to introduce and demonstrate the benefits in terms of payment for productivity.
- The CMPL will continue with promotion to industrial groups, universities and government on a national and international level, in order to convince businesspeople of the benefits of the model.
- The CMPL will ask potential companies for the letter of intent to formalize their interest in this project.
- The Chemical Leasing team will structure training material that offers more detail about the elements necessary for understanding, step-by-step, the implementation of the project.
- The CMPL will maintain its commitment with ONUDI and other National Centers to offer support for the launch of the Chemical Leasing project.
- The CMPL will publicize the model by means of its Web page.
- The CMPL will coordinate the first regional conference on cleaner production to be held in Mexico, with this being a massive channel for the presentation of the Chemical Leasing model, and expects to generate a series of companies interested in adopting it.
- The CMPL will seek contact with the Mexican Secretary of the Environment in order to promote implementation of the model on a national level.

5. CONCLUSIONS

- The companies contacted (mainly users) show interest in the model and the benefits represented by adopting it: Nevertheless, it has been difficult to structure contracts in term of payment for productivity, since the supplier companies fear change.
- The way that companies operate in Latin America is very different from European frameworks, which requires adjustment in the way of presenting the model and longer times for adopting it.
- In Mexico, it has been difficult to enter government companies, since the acquisition of chemical products requires a tender process, which often is removed from the elements of Chemical Leasing.
- Sometimes the supplier does not want to take charge of the waste generated (spent chemicals), because Mexican regulation would require that it register as a waste generator, and this would force it to perform an additional operation that would raise its operating costs.
- The CMPL has the technical capability and infrastructure to be able to advise other National Centers that initiate their implementation activities.