



From Editor's Desk

Asian Paints Ltd was the recipient of Gujarat Cleaner Production Award for Large Scale industry in the year 2006-07. For SMEs, Canberra Chemicals, Nandesari was the Award winner. This issue covers the steps taken by Canberra Chemicals which helped it to get the coveted Gujarat Cleaner Production Award 2006-07.

In December 2009, when the whole world was preparing for Copenhagen Summit on Climate Change, GCPC had organized a workshop on "Chemical Leasing" in association with UNIDO on 3rd December 2010. "Chemical Leasing" is a novel concept to close the material cycles between suppliers and users of chemicals. Being a new concept, there are only a few case studies on it and are still many questions on how to implement it. GCPC has started working on popularizing the concept and generating some case studies.



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CLEANER PRODUCTION CASE STUDY: CANBERRA CHEMICALS, NANDESARI, VADODARA

Industry Background

M/s. Canberra chemicals, a partnership concern, is promoted by Shri B.C.Patel, a Technocrat with M.Sc. in Chemistry from Bombay University. He taught Chemistry as a Professor at Ramnarayan Ruia College for 4 years. Later, he started a R&D center for development of Bulk drugs in Mumbai. In 1974, he came to Vadodara to offer turnkey Consultancy for a Bulk Drug plant. In 1975, he started his own firm **M/s. Canberra Chemicals**, under New Entrepreneur Scheme (NES) and obtained finance from GIIC Ltd.



M/s. Canberra Chemicals, took the possession of Shed C-1 type in GIDC, Nandesari in the year 1975. In 1977, it was registered as SSI unit, obtained Drug License & started the Production.

M/s. Canberra Chemicals is now a 32 year old concern and has started 3 other concerns at Nandesari. (M/s. Munich Chemicals, M/s. Norris Chemicals and M/s. Rhine Laboratories). Now, it is a family concern having good team work of new and old generation. Young and old generation are working together with new ideas for cleaner production.

"Profits may follow, however that is never our immediate motto, as it will close the doors for new ideas."

"Cleaner Production Team from Gujarat cleaner Production Centre, under the leadership of Mr. Bharat Jain, always motivated and encouraged as for adoption of Cleaner Production"-Mr. B. S. Patel

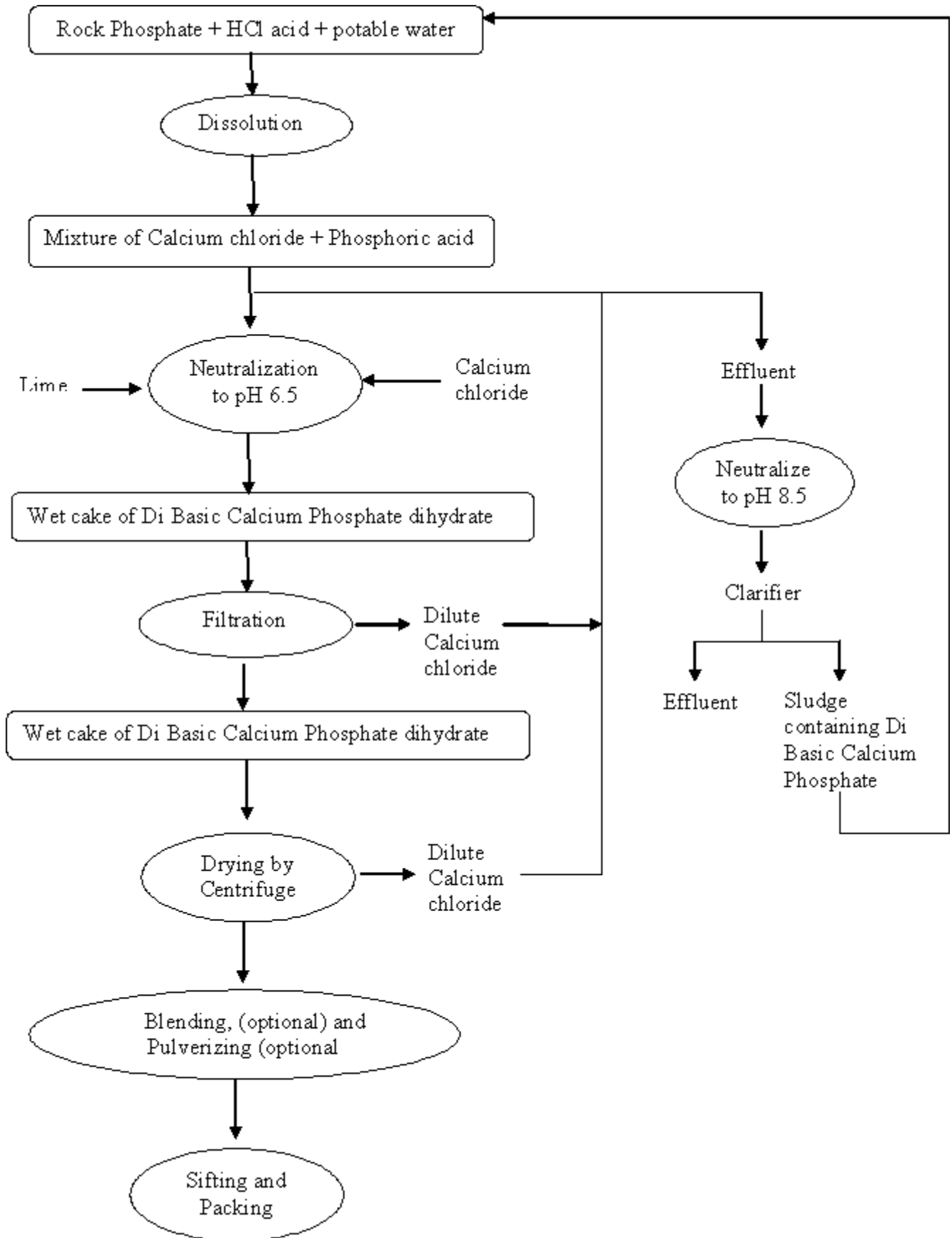
Achievements of Canberra Chemicals, Nandesari

It is a ISO 22000 certified company by **BVQI** and audited every year by **Multinational Pharmaceutical companies viz. Glaxo, Pfizer, Ranbaxy, Zydus Cadilla etc.**

Manufacturing Process Description:

- Rock Phosphate is dissolved in Hydrochloric Acid to give Calcium Chloride & Phosphoric Acid.
- This mixture of Calcium Chloride & Phosphoric Acid is neutralized to pH 6.5 by adding calcium carbonate and lime to precipitate out Di Basic Calcium Phosphate,
- This is sent to filtration system to remove dilute calcium chloride solution along with washing of Di Basic Calcium Phosphate.
- Part of this solutions (mainly having Calcium Chloride content high) is recycled for next batch & balance quantity gets discharge as effluent.
- If the pH of the effluent is less than 6.5 than hydrated lime solution is added in neutralizer with stirring to obtain pH 6.5 to 8.5, than it is pumped to filter unit through clarifier to remove sludge which is Di Basic Calcium Phosphate, which is re-dissolved along with Rock Phosphate.
- While effluent which is colorless to very light yellow color is discharged to collection tank for dispatch to Common Effluent Treatment Plant by Tanker.

FLOW DIAGRAM FOR DI CALCIUM PHOSPHATE DIHYDRATE



Cleaner Production Option Implemented:

Following are the exemplary CP options implemented at Canberra Chemicals:

- Increase in yield of product
- Calcium chloride recovery from effluent
- Change of fuel
- Recovery of chloroform in QC test Procedure
- HCl Tanker unloading modification

(I) Increase in yield of product:

Year	RM Procured	Production	% Yield
2006-07	438 MT	260 MT	59.3
2007-08	480 MT	305 MT	63.5
2008-09	586 MT	415 MT	70.8

- Before CP implementation: neutch filter was used to dewater the sludge.
- The sludge is difficult to filter with corresponding loss of soluble P_2O_5 .

Cleaner Production Step:

- A Filter Press was installed which yielded excellent recovery.
- On analysis of rock phosphate sludge, it was observed that it contained mono calcium phosphate as high as 25% i.e. around 15% P_2O_5 which is accepted for manufacturing single super phosphate.
- They approached various fertilizer making units and they accepted the material. Now the sludge is being sold and if not sold it is sent to TSDF of Nandesari Environment Control Ltd., Nandesari for land filling. This sludge can also be used as soil conditioner.



Installation of Filter Press



Dewatered rock Phosphate Sludge

Environmental benefit:

- Less solid waste generation
- By product recovery (CP tool)

Economic benefits

- Less solid waste sent to TSDF, therefore less charges.
- By product, reused as fertilizer, is sold.

(II) Calcium chloride recovery from effluent:

Before Cleaner Production: Effluent containing calcium chloride was sent to effluent treatment plant.

Cleaner Production Step:

Effluent stream containing 8-10% Calcium chloride is segregated. It is treated with lime/ limestone and HCl to increase the concentration to 20%, which is saleable as brine solution.

Uses of Calcium Chloride

- Calcium chloride is used for dust control on unpaved roads.
(Can be used on construction sites, during construction of roads, national highways etc.)
- Can be exported as antifreeze mixture to melt ice and snow.

USE: The *anhydrous* form used as a drying and dehydrating agent for organic liquids and gases, and in desiccators. The *dihydrate* and *hexahydrate* forms are used for antifreeze and refrigerating solns, in fire extinguishers, etc. (a 40% soln freezes at -41°); to preserve wood, stone; manuf ice, glues, cements; fireproofing fabrics; automobile antifreeze mixtures; to melt ice and snow; as coagulant in rubber manuf, as size in admixture with starch paste; in concrete mixes to give quicker initial set and greater strength; freezeproofing of coal and ores; dust control on unpaved roads; sizing and finishing cotton fabrics; as brine for filling inflatable tires on tractors to increase traction.

Source : MERCK INDEX



P₂O₅ containing stream NOW recycled back to process

Environmental benefits

- Less chemicals are used for treatment of effluent (conservation of raw material)
- By-product recovery (CP tool)

Economic benefits

- Less effluent to be treated
- By-product, brine solution to be sold

(III) Change of fuel:

Before CP: Initially fuel used was LDO, which was replaced with fire wood in gasifier and then finally Natural Gas.

Cleaner Production Step:

Canberra Chemicals was the first unit in GIDC, Nandesari, to risk use of high priced natural gas compared to cheaper fuels like lignite/ coal/ Wood/ biofuel.

Initially tray driers were being used for product drying. These have been replaced with fluid bed dryers using natural gas as fuel. This has resulted in improved efficiency and power saving.

In boiler, stack gas temperature monitoring coupled with connection to gas burner has given control over hourly fuel consumption.

Environmental benefits

- Use of clean fuel
- Stack gas temperature monitoring has given control over hourly fuel consumption (CP tool- Better Process Control)

Economic benefits

- Replacement with fluid bed dryers using natural gas has resulted in improved efficiency and power saving

(IV) Recovery of Chloroform in QC test Procedure:

The company product is used in Food industry. As per Food Chemical Codex, a test of Heavy metals requires use of 300- 600ml chloroform during tests. The method suggests to evaporate the chloroform on water bath.

Cleaner Production Step:

Though the frequency of testing is less, they have started to recover the chloroform by distilling, instead of evaporating it in air (since chloroform is categorized as an ODS substance).

They also bring the heavy metals of all standard solutions first by dilution to acceptable levels and then spike it with calcium sodium edetate which is a good antidote.

This is also in line with good laboratory practices and also a part of Cleaner Production programme as production has to be clean at all levels.



Chloroform distillation and recovery system

Environmental benefits

- Chloroform, an ODS, is not discharged to atmosphere

Economic benefits

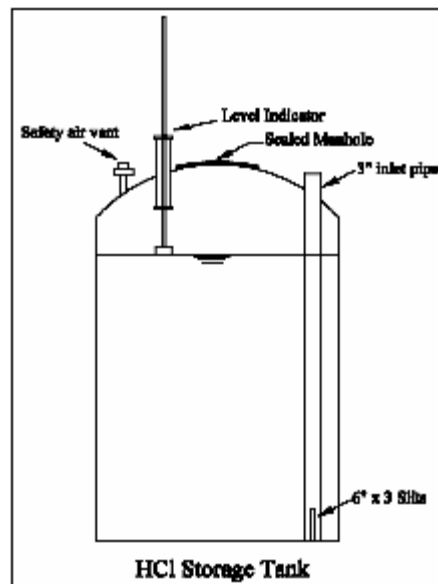
- Amount of chloroform purchased reduced

(V) HCl Tanker unloading modification:

Fugitive emissions of HCl during tanker unloading.

Cleaner Production Steps:

They have invented a modification in the tank to unload the tank without any fugitive emissions especially during rainy season. They have inserted a 3" inlet pipe to the bottom of the tank with slits at the bottom. A level indicator and a safety air vent are also installed. Therefore, if pressure increases, air vent opens to release the pressure.



Environmental benefits

- HCl is highly corrosive and when released in atmosphere causes eye and skin irritation and also damages respiratory organs.

Economic benefits

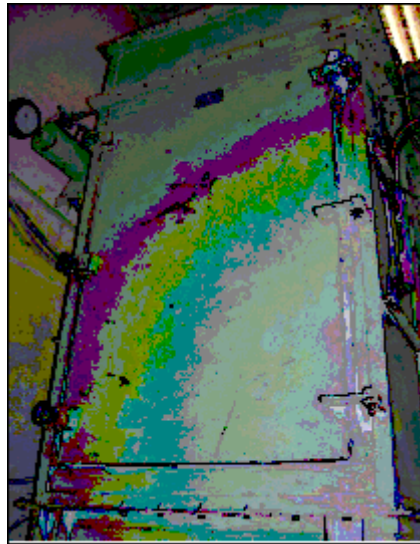
- Fugitive emissions of HCl reduced

(VI) Installation of dust collector:

During pulverizing, shifting of material etc., dusting was a problem.

Cleaner Production Steps:

A dust collector was installed with material collected giving recovery of 0.1%. The working environment is now almost dust free.



Fugitive Dust Collector

Environmental benefits

- Reduced dusting

Economic benefits

- Recovery of 0.1 % product.

(VII) Plantation Around the Company:



Plantation opposite Canberra Chemicals

Plantation of the following plants:

- | | | |
|---------------------------------|--------------------------------|-------------------|
| 1) Adasi (for cough/leprosy) | 7) Satvari (for acidity/ulcer) | 13) Karan |
| 2) Tulsi | 8) Damvel | 14) Champa |
| 3) Madhu Nasika (for diabetes) | 9) Limdo (Antiseptic) | 15) Boganwel |
| 4) Sadhawel (for Rhumetism) | 10) Sapta Parni | 16) Kena |
| 5) Kadam | 11) BVaniyan tree | 17) Bangali Bawal |
| 6) Ashwa gandha (general tonic) | 12) Baramasi | |

Advantages of Implementing Cleaner Production:

1. Reduction in consumption of raw materials per MT of finished product:

Raw Material	Before CP	After CP
Hydrochloric Acid	3.554 MT/MT	2.495 MT/MT
Calcium Carbonate	692 kgs	308 kgs

2. Reduction in water consumption :

Source	Before CP	After CP
GIDC Water supply	18.66 m ³ /MT	15.44 m ³ /MT

3. Reduction in fuel consumption :

Before CP	After CP
LDO - 415 L/MT	
Coal - 3275 kg/MT	Natural Gas - 385 Sm ³ /MT
Wood - 6500 kg/MT	

4. Reduction in Electricity consumption :

Source	Before CP	After CP
MGVCL	600 KW/ MT	285 KW/ MT

5. Reduction in waste water generation :

Before CP	After CP
16.66 m ³ /MT	14.44 m ³ /MT

6. Reduction in Solid Waste generation:

Before CP	After CP
360 kg/MT	220 kg/MT

Workshop on Chemical Leasing, 3rd December, 2009, held at Ahmedabad

The Chemical Leasing workshop was organized by Gujarat Cleaner Production Centre (GCPC), Gandhinagar in association with United Nations Industrial Development Organization (UNIDO), Vienna, Austria on 3rd December, 2009 at The Gateway Hotel Ummed, Ahmedabad. The basic purpose of the workshop was to create awareness about Chemical Leasing concept. The delegates from various sectors of industries like Dyes and Dye Intermediates, Chemicals, Paint Industry, Electroplating, Pulp and Paper, Industries Association, Academic Institutes, Government Officers, etc. were invited for this workshop.

In the beginning two minutes silence was observed in the memory of people who had died due to toxic gases of M/s Union Carbide which occurred in Bhopal before 25 years.

The inaugural of the workshop was started with lightening of lamp by dignitaries like Mr. R. Parthasarathy, IAS (Retd), Dr. Anurag Priyadarshi, Mr. Smail Alhilali, UNIDO, Ms. Petra Schwager, UNIDO Mr. Navin Juneja, Shri Babubhai Patel, Chairman, Federation of Industries Association, Gujarat, Shri Bipinbhai Patel, Chairman, Green Environment Services Co-operative Society Limited., Vatva, Shri Saileshbhai Patwari, Chairman, Naroda Enviro Project Ltd., and Shri J.K.Vyas, Additional Secretary and Director (Environment), Forests and Environment Dept., Govt. of Gujarat.

Mr. Bharat Jain, Member Secretary, GCPC, welcomed the dignitaries, faculties of the workshop and also participants.

Mr. Smail Alhilali was invited for introductory speech on various activities of UNIDO; he mentioned in brief about various activities taken up by UNIDO in the field of environment in general and particularly Cleaner Production and Cleaner Technology. He mentioned about the network of more than 40 NCPC across the globe and appreciated the work taken up by Gujarat Cleaner Production Centre.

Next speaker was Ms. Petra Schwager, who made a detailed presentation on Chemical Leasing (ChL). She mentioned that ChL suggests new forms of payment for chemicals that direct the economic interest of all partners towards process optimization and reduction of chemical consumption. It is relation between chemical producers and its users work, the producer also provides chemical services, as the payment is not for the chemical itself but for the benefits of the chemical For example not for tonnes of solvents used but for number of pieces cleaned. She described the traditional business models wherein the supplier is working on "more is better" while consumer "less is more" and compared with ChL model where both suppliers and consumers are working towards "less is more". She discussed the objectives of UNIDO's ChL programme and its approach. She also discussed the test case of powder coating in ABB-Arab and explained the scenario of before and after, discussing the economic and environmental benefits. The opportunities and challenges were also discussed at the end of presentation. Video on "ChL Business Models" prepared by UNIDO was shown to the participants. The presentation along with the video generated many questions and queries from the participants, right from the definition of ChL to its implementation in the respective cluster of industries. The queries were answered by Ms. Schwager, Mr. Alhilali & Dr. Anurag Priyadarshi.

Mr. R. Parthasarathy was invited for his presentation on "Chemical Legislation in India" He mentioned that as on date there is no chemical legislation in India. However, he made an interesting presentation on REACH -European regulation, concerning Registration, Evaluation, Authorization and Restriction of Chemicals, which came into effect from June, 2007. He described a time-table of each set up. The first phase including free Registration and next was of list of Production. He mentioned that REACH applies to 1500 chemicals. In his presentation Mr. Parthasarathy mentioned that worth of chemicals from Indian market is 6 to 7 million \$, out of which Gujarat has share of 50% and therefore, concerned industries must understand this, though there is a shortage of experts in that field. There were many questions from the participants which were replied by Mr. Parthasarathy.

After a Coffee break, next presentation on "ChL in India and in Textile Sector" was presented by Dr. Anurag of IKEA. He discussed a case study of implementation of ChL in textile industry; he presented a challenge of its processor in textile industries which includes low production; high production cost, high quality reduction etc., and the future targets to overcome the challenges. A video was also shown; he concluded that ChL concept was business oriented model which includes high quality services, training, improvement of productivity with reduction in cost, improving quality and safety at work place. He also presented the benefits of implementation of ChL concepts. The case study was implemented by M/s Huntsman. The service offered by M/s. Huntsman was also presented. There were many questions from the participants on the implementation of ChL which were answered by Dr. Anurag Priyadarshi.

After lunch break, Mr. Navin Juneja of DNA Experts Service, made presentation on "ChL experience of chemical providers". He mentioned that idea of ChL was presented in the year 2005. The first project started in 2006 and second in May 2007, third started in February 2008. It also initiated one in Pakistan and one in Bangladesh. He mentioned about the initial reaction of partners and their reservations and discussed how the same were overcome. He also discussed various steps of implementation and the benefits. Mr. Juneja also presented the draft of agreement for ChL project.

In the last presentation, on Introduction to the UNIDO ChL tool kit, guidelines, worksheets and other materials was presented by Ms. Schwager and Dr. Anurag Priyadarshi. The first attempt was to give concrete guidelines based on experiences obtained in Egypt, Mexico and Russia to experts like NCPCs. The Toolkit covered main steps for smooth and efficient application of ChL to industries. Ms. Schwager presented first step for ChL implementation, screening of ChL project and selection of potential ChL clients. The various elements, tools and worksheet of ChL were also discussed. Dr. Anurag mentioned about the sustainable consumption, production and management of chemical in India can be achieved through joints efforts on Cleaner Production and ChL. The presentation was concluded by Ms Petra Schwager with a quotation of Henry Ford "Coming together is beginning, Staying together is progress and working together is success"

There were many questions from the participants which were answered by Ms. Schwager and Dr. Anurag Priyadarshi. At the end of Workshop Mr Bharat Jain, MS, GCPC offered Vote of Thanks.

Only around 3% of the world's water is fresh water suitable for drinking purpose. Industry as a major user of this precious resource so, conserve and prevent it from getting contaminated for sustainable development.



Set up a Water Conservation Program

- ✓ Raise employee awareness
- ✓ Seek ideas from employees
- ✓ Reward employees



- Install high pressure, low volume nozzles on spray washers
- Inspect nozzles regularly for clogging
- Adjust pump cooling and water flushing to the minimum required



- Turn off all flows during shutdowns
- Use solenoid valves to stop the flow of water
- Adjust flow in sprays and other lines
- Use Hoses sparingly and only when necessary

IDENTIFY

- Areas in your plant where water is wasted
- Possibility of reuse
- Quality, Quantity and Temperature of water
- Area where water storage tank or ground water is contaminated from effluent

DETERMINE

- Capacity of each water containing unit & continuous discharge not yet being reused.
- Flow rates in floor gutters
- Reclaimed water to increase the number of times it can be reused.

PRACTICE

- Filter back flush
- Boiler make up
- Equipment cleaning, floor and gutter wash
- First rinses in wash cycles
- Gardening
- Rainwater Harvesting
- Check the contamination of water



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Workshop on Chemical Leasing, 3rd December, 2009, held at Ahmedabad



Dignitaries at Chemical Leasing workshop



Ms. Petra Schwager,
Industrial Development Officer,
UNIDO presenting Concepts of Chemical Leasing



Participants of the Workshop

This publication aims at disseminating information on pertinent development in its specific field of coverage. The information published does not, therefore, imply endorsement of any product/process/producer or technology by GCPC



We would appreciate if you send your comments & suggestions

Er. Bharat Jain, Member Secretary

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