Case Study:	Waste Management Practices in a Paint Industry

I. Background Information

In a paint industry, waster is used extensively for cleaning purposes resulting in huge quantity of waste water. Further large quantity of wastes (both solid & hazardous wastes) are generated leading to handling issues. Effective utilization of resources leads to minimal waste generation. Generation of waste very often indicates, process inefficiency. Therefore, the focus on resource conservation is on top priority.

II. Best Practices – Waste Water Management:

A. Elimination of waste streams:

(i) Caustic wash elimination:

In Resin House, reactors and blenders used to be cleaned with caustic solution to maintain the required hygiene. This practice was later changed by MTO boiling. The boiled MTO thus generated is added back in the product at the blending stage. This has eliminated need for frequent caustic cleaning of reactors.

(ii) Emulsion wash water reuse:

In the emulsion manufacturing process, wash water generated from emulsion reactors used to be treated in ETP. A new scheme has been implemented, after sufficient studies at the central R&D facilities. In this scheme, all the wash water generated during cleaning is added in the same batch. This scheme has eliminated emulsion wash water stream.

Emulsion Wash Water Reuse System

B. Minimizing effluent generation:

(i) Fewer shades, more bases:

Wastewater generation in a paint industry is mainly due to equipment washings that are carried out during product or shade changes. By properly scheduling the production plan and by making more bases than shades, this problem can be minimized. With implementation of i2 technologies-Rhythm software (Supply Chain software) this scheduling is effectively done. With the introduction of Dealer Tinting System (DTS), the need for producing shades has reduced drastically. More of white bases are made in the plant and tinting is done at retail outlets.

(ii) Use of Jet Pumps:

Jet pumps are used for all reactor and mixer cleaning in water based section which reduced the water consumption to less than $1/10^{th}$ of normal requirement

Photograph of Jet Pump

(iii) Use of 'Water-Jet' arrangement for hoses:

Flexible hoses are used for many applications such as floor cleaning, packing material cleaning, packing machine cleanings etc. There is a possibility of the user not closing the valve when using the hose if the valve is located at a distance. Hence no open hoses are maintained in the process areas. Instead every hose pipe is fitted with this jet arrangement that gets activated only when the user keeps the handle pressed.

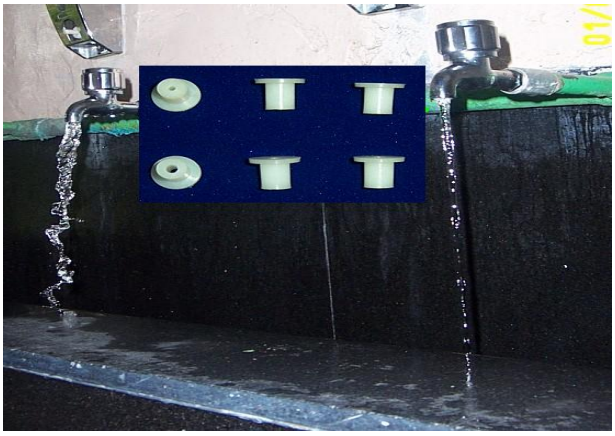
Photograph of Water Jet Arrangement for Hose Pipes

(iv) Multiple use of wash water:

Wash water generated from caustic wash of mixers, reactors and other vessels is reused again till all the caustic in the wash water is used up.

(v) Use of nylon orifice in taps

Use of nylon orifices in taps reduced the waste water generation substantially.



Water Taps 'With' and 'Without' Nylon Orifice

Shown at the Centre are the Orifices Used

(vi) Water Budget

A unique system called as **'Water Budget**' was introduced to estimate and provide the required water for each end user. The estimate is based on process requirement, man power deployed and other factors. Any excess consumption is to be explained on the same day by the user. This is an excellent tool for reducing effluent generation since any excess water consumption results in effluent generation.

(C) Reuse of waste water:

(i) AMC wash water:

AMC refers to "Apcolite Machine Colorant" a product used for tinting white bases at retail outlets. This is one of the high strength streams that is difficult to treat in ETP and generates high quantities of sludge.

A new waste minimization scheme is being implemented with an Ultra filtration system for reuse of this wash water back in the same product.

Ultra filtration of AMC washes water and Storage tanks

(ii) Emulsion Paint Wash Water:

This is another revolutionary scheme implemented for reuse of wash water generated from cleaning of emulsion paint equipment. The wash water thus generated is collected, batched and reused in the subsequent batch of same product. This has minimized effluent generation substantially and is also offering monetary benefits.

Containers used for wash water collection and storage

(iiii) Treatment and Recycle of waste water:

Effluent not suitable for any reuse is treated in Effluent Treatment Plant (ETP) and the treated effluent is reused gardening, floor cleaning and toilet flushings. No treated effluent is sent outside the plant premises.

Photographs of ETP

III. Best Practices – Hazardous Waste Management:

A. Bulk storage facilities for monomer:

Earlier the monomers were bought in barrels. Handling these material in barrels lead to material loss. Facilities are provided for bulk storage and direct transfer to shop floor that eliminates the need to handle these hazardous chemicals in barrels. This facility has eliminated sticking losses in barrels conserving substantial quantities of this expensive and hazardous chemical.

Bulk Storage Facilities - Monomer Tank Yard

B. Minimising Waste Streams :

(i) Reduction in waste solvent generation:

Many streams were identified where less solvent can be used for cleaning. This helped in reducing the generation of waste solvent.

(ii) Reduction in hopper scraping generation:

A surfactant mix is applied in the hopper for minimizing generation of hopper scrapings.

(iii) Reduction in filter aid waste generation:

Conventional filters were replaced with 'Leaf Filters' in Resin House which has drastically reduced generation of filter aid waste.

Leaf Filer in Resin House

(iv) Reduction in waste powder generation:

Double packing of extender bags reduced waste powder generation during unloading and transfer to sections.

C. Recycle / Reuse of wastes :

(i) Reuse of hopper scrapings:

Hopper scrapings are collected, segregated stored and reused in suitable next batch.

(ii) Reuse of waste solvent:

Solvent suitable for washings are stored and reused for next washings instead of directly sending for recovery.

(iii) Reuse of non-conforming products:

NCP resins and paints are stored in separate earmarked locations for reuse in next batch.

(iv) Recycling barrels:

Hazardous barrels received at Scrap Yard are detoxified by thorough cleaning before disposal. Many of these barrels are used for packing resin, recovered solvent and certain other material.

D. Storage, Treatment and Disposal

(i) Storage :

Hazardous wastes in barrels are stored in Scrap Yard that has a concrete platform with containment. For certain categories of wastes not stored in barrels, concrete compartments exist for storage. This segregation avoids mixing of hazardous and non hazardous waste. Separate Red, Orange and Green zones are maintained for Contaminated, Cleaned and Inspected & Approved barrels respectively.

Red and Green Zones in Scrap Yard

(ii) Incinerator:

An Incinerator is installed for treating hazardous wastes which are non-reusable. Incineration reduced the volume of the wastes and also makes management of the hazardous waste safer.

Primary and Secondary Chambers of Incinerator

(iii) Detoxification systems:

Barrels are cleaned with hoop mixers and Barrel Rollers. Water, Caustic solution or suitable organic solvents are used for cleaning. Small containers are detoxified by crushing and incineration. This ensures misuse of these containers and possible health problems associated with misuse

Detoxification Systems at Scrap Yard

III. Best Practices – Conservation of Resources:

A. Water conservation by rain water harvesting

All the plants have a rain water harvesting system for direct roof top collection and reuse. The rain water in the roof top is collected and

transferred to a collection sump. Quality of the collected water is checked and pumped for suitable use after filtration. The water is generally used for process after mixing with other normal water. Alternatively it is either treated in softener / RO or used for utilities like boiler / cooling towers.

Rain Water Harvesting System-1.Roof Top Collection 2.Intermediate Storage

B. Conservation of fuel

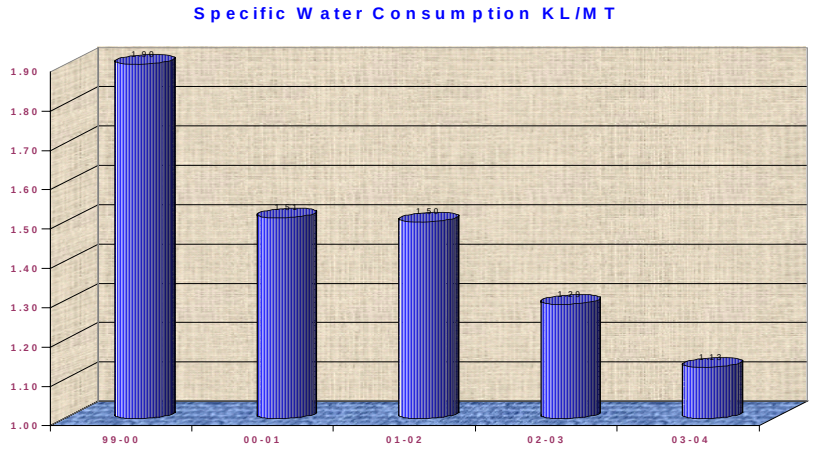
Several initiatives are taken to minimize fuel consumption. Some of the initiatives include, interconnection of reactors to utilities, production planning to process many batches simultaneously when utilities are on, reduction of cycle time through RCA, improving the combustion in the utilities and minimizing heat loss.

C. Conservation of electric power

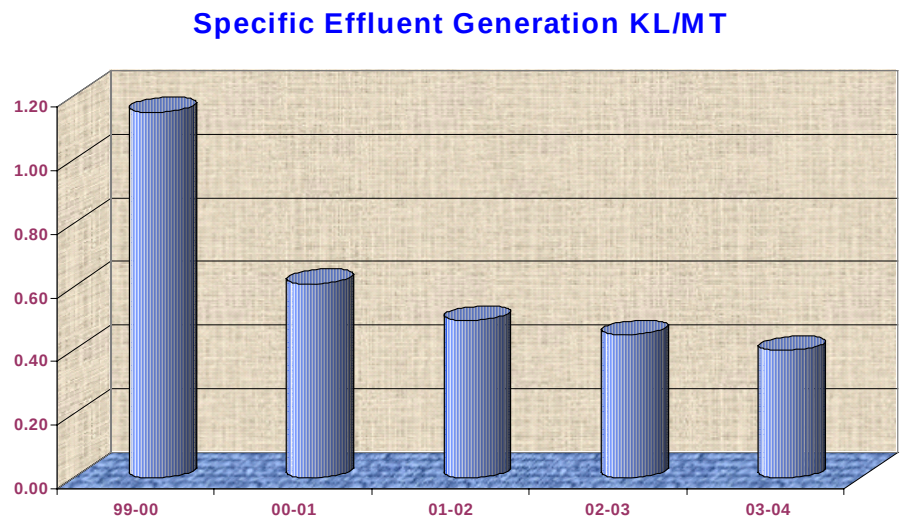
Several initiatives are taken to minimize power consumption. Some of the initiatives include, awareness building on the importance of power conservation, implementation of energy audit findings, entitlement study and control, production planning etc.

IV. Benefits :

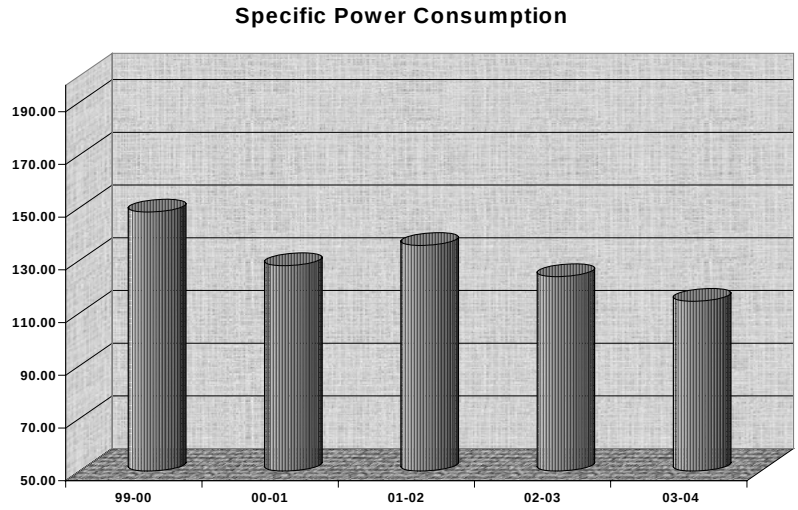
A. Reduction in specific water consumption



B. Reduction in specific effluent generation



C. Reduction in specific power consumption



D. Reduction in specific fuel consumption