News Letter On Cleaner Production And Technology

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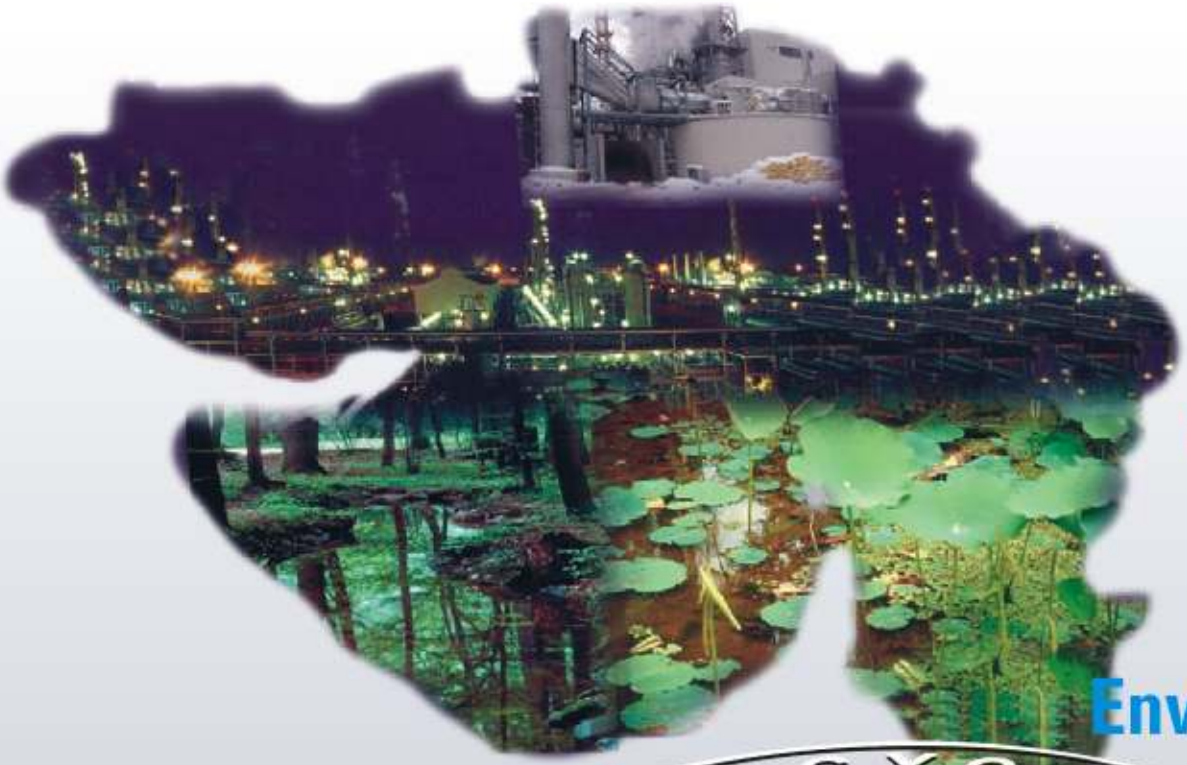

Green & Clean Environment

RECYCLE GCPC REUSE

GUJARAT CLEANER PRODUCTION CENTRE
Estd. by : Gujarat Industrial Development Corporation (GIDC)

Technical Article Series IV

CLEANER PRODUCTION IN CHEMICAL PRODUCTION (CP IN CP)

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Recycle, Reuse, Recover are most important words for Cleaner Production practitioners. The application of three R's can be best understood by case studies and real examples only. In past, in several issues of this newsletter, attempts were made to provide details of various CP demonstrations of **Gujarat Cleaner Production Centre**, three R's were successfully implemented.

In this article recovery of butyl alcohol from effluent is described.

A resin-manufacturing unit was generating mixture of butyl alcohol and water. After separation of butyl alcohol layer, water used to be drained into effluent treatment plant. This water normally contains 7 to 10 % butyl alcohol and COD of water was found to be in lacs. Characteristics of butyl alcohol are as under.

Physical properties of butyl alcohol

- Molecular formula : $CH_3CH_2CH_2CH_2OH$
- Density : 0.810 gm/l
- Boiling point : 117 - 118 ° C
- Solubility : Miscible with alcohols, ethers and other organic compounds.
- Solubility in water at 25 ° C : 9.1 ml/100 ml water

Note :

A mixture of 63 % of alcohol and 37% of water forms a constant boiling mixture at 92° C.

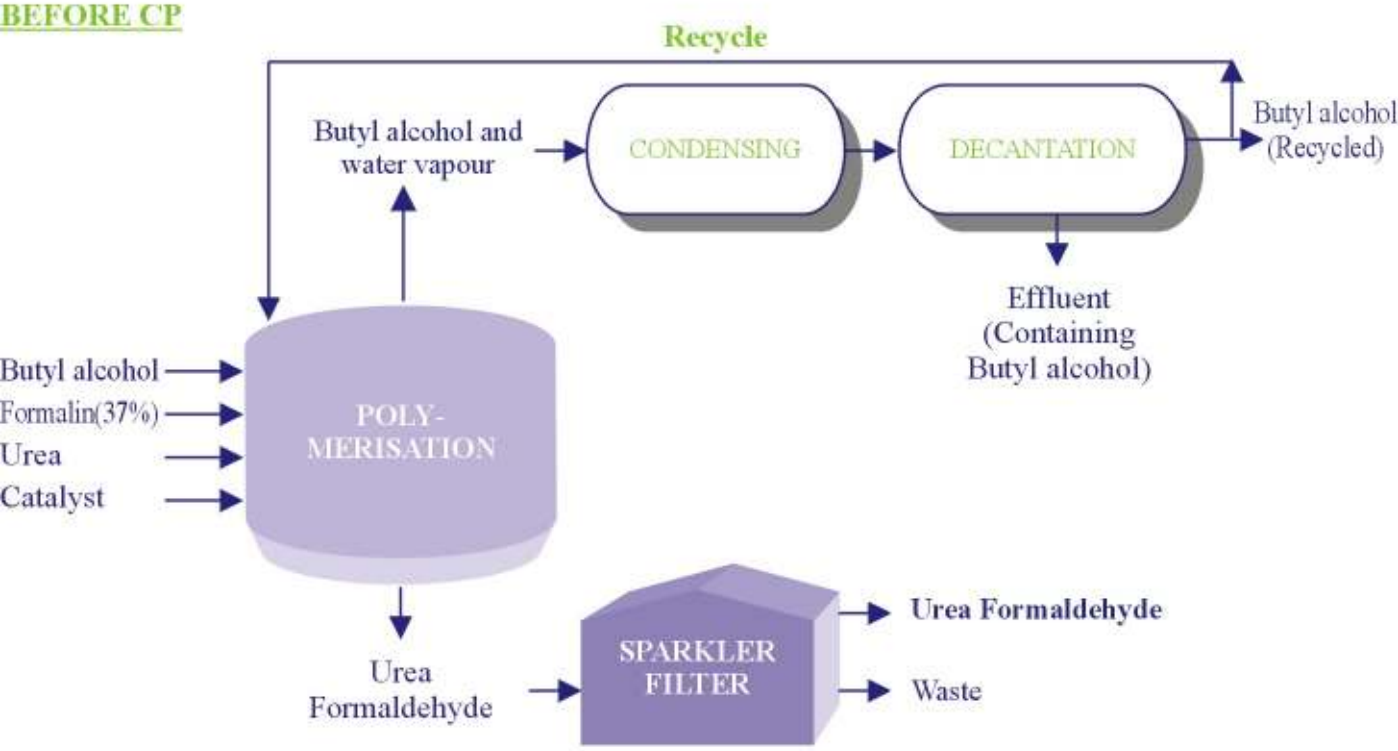
MANUFACTURING PROCESS OF UREA-FORMALDEHYDE :

The urea is reacted with 37% formalin in the presence of butyl alcohol as a solvent. The small amount of catalyst is added to the reaction mixture. The Urea Formaldehyde resin formed is in the liquid form and is collected from bottom of reactor. The vapour from the top of the reactor are condensed in the condenser. The condensed steam is routed to the decanter to separate water from the solvent and the solvent is recycled into the reactor.

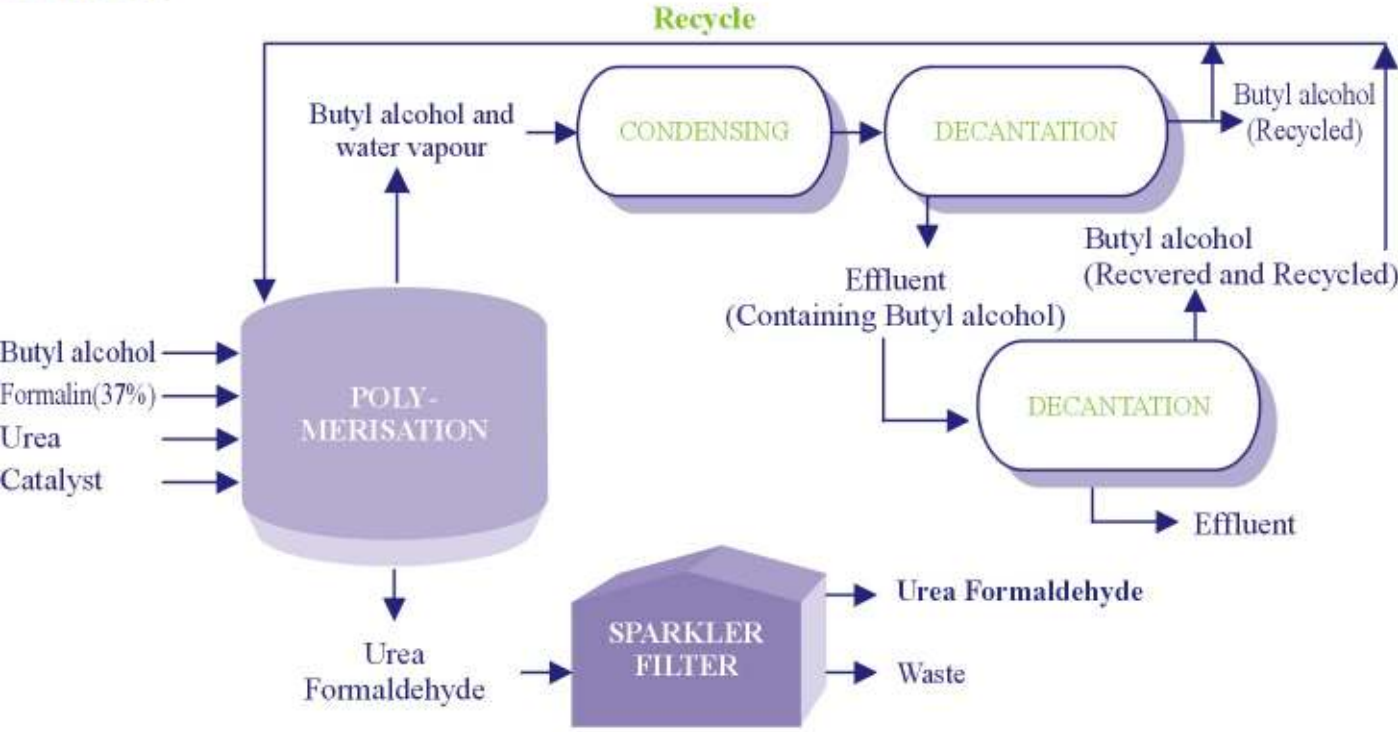
Flow diagram of process before and after CP activity is shown in Fig.

PROCESS FLOW DIAGRAM :

BEFORE CP



AFTER CP



MATERIAL BALANCE :

❖ BEFORE CP

Stage I : Polymerisation

Urea	524 kg	→ REACTOR →	Resin	2000.5kg
37% Formalin	2000 kg			
Butyl alcohol	1810 kg		Butyl alcohol and water Vapour	2381.5kg
Catalyst	48 kg			
Total : 4382 kg			**Total : 4382 kg**	

Stage II : Filtration

Resin	2000.5kg	→ SPARKLER FILTER →	Urea Formaldehyde	2000kg
			Waste	0.5
Total : 2000.5 kg			**Total : 2000.5 kg**	

Stage III : Condensation and Decantation

Butyl alcohol and water Vapour	2381.5kg	→ CONDENSATION & DECANTATION →	Butyl alcohol	1048 kg
			Effluent (Contain 8% butyl alcohol)	1333.5 kg
Total : 2381.5 kg			**Total : 2381.5 kg**	

During production observation and from material balance, it came out that unit is loosing 732 kg of butyl alcohol, out of these 625 kg is going along with product and 107 kg is going along with effluent. Analysis of effluent revealed the presence of almost 8% of butyl alcohol and COD more than 2,00,000 mg/lit.

❖ AFTER CP

The material balance for three stages of reaction is carried out as above and as a C. P. Option, fourth stage of distillation of effluent has been added as shown :

Stage IV : Simple Distillation

Effluent (Contain 8% butyl alcohol)	1333.5kg	→ SIMPLE DISTILLATION →	Effluent	1242.5 kg
			Butyl alcohol	91 kg
Total : 1333.5 kg			**Total : 1333.5 kg**	

OPTIONS OF CLEANER PRODUCTION

Detailed analysis of effluent and product indicated that effluent contains 107 kg of butyl alcohol, while 625 kg goes along with product. Recovery from 107 kg of butyl alcohol was attempted by simple distillation in existing reactor and it was found that 85 % could be recovered very easily i.e 91 kg of butyl alcohol could be recovered. Laboratory trials with adequate columns and fractional distillation showed recovery of 95 % butyl alcohol. Unit immediately implemented simple distillation option and results are encouraging.

The financial and environmental gains are summarised as under:

- Butyl alcohol which was going along with effluent earlier is now recovered.
- By recovery of butyl alcohol, about 2,00,000 mg/lit COD load of effluent as well as 91 Kg. effluent quantity decreased.
- By decreasing the effluent quantity, the treatment cost also reduced from around Rs. 12 lacs/year to Rs. 5.5 lacs/year. Therefore saving in treatment cost is Rs.6.5 lacs/year

Financial saving for the unit is very high. One kg of butyl alcohol is costing Rs.48. By recovering and reusing butyl alcohol around Rs.36 Lacs saved per annum with nominal investment.

AVOID WASTE

Waste Arising From

Transport : Unnecessary movement of man & material.
Process : Unnecessary steps or ineffective methods.
Overproduction : Producing more then necessary.
Motion : Unnecessary motions.
Waiting time : Idle time of man or machine.
Defects : Goods that do not meet quality specifications.
Inventory : Excessive work-in-progress or inventory.

CLEANER PRODUCTION- CASE STUDY OF A TEXTILE PROCESS HOUSE

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PREFACE

As the world opens up as a single market without boundaries, industries in developing world faces different set of problems and so it demands a planned solution. If globalization is the key word bringing threats in our hearts and life, then Sustainable Development is the key answer. With this one can easily conclude that CLEANER PRODUCTION forms the most important part of sustainable development. If we conserve, or reduce, or replace with right inputs or recycle, we can sustain in our industrial sector.

LUTHRA DYEING AND PRINTING MILLS, SURAT

Luthra Dyeing and Printing Mills have achieved a great deal of success and we would like to discuss not only the success stories but also some of the managerial and implementation problems and solutions by adopting cleaner production techniques & implementing environmental management problems. The mill located at Surat, India, is engaged in a wet processing of synthetic fabrics including dyeing, bleaching, printing and finishing. The process causes air and water pollution. As a final result of effluent treatment, hazardous solid waste is generated. The company had started implementation of cleaner production techniques in the year 1993. This finally helped a lot to be a more sustainable as compared to many other, in spite of tough competition. So economy prevailed along with ecological advantage. The company has received a National award for development of direct gas fired and steam blended ager system in the year 2000 and for this system, the patent was filed by the company. Further to this, the company has obtained ISO 14001 certificate.

IMPLEMENTATION OF CLEANER PRODUCTION TOOLS

REPLACEMENT OF CHEMICALS : -

(a) Acetic acid was substituted by Formic acid for reduction in COD load.
(b) Poisonous Non-ionic detergent was replaced by non toxic and cheaper anionic detergent.
(c) Citric acid was replaced by Citric W for financial saving and reduction in COD & BOD load.
(d) Carcinogenic and Allergic dyes were avoided.

GOOD HOUSEKEEPING : -

(a) All leakages of water and steam pipes were repaired.
(b) Cooling water and condensate from machines were collected and reused.
(c) The dye bath was reused.
(d) Blanket washing water was recycled.
(e) Good inventory control practices in the dyes and chemicals were ensured.
(f) Gray cloth having less oil and other impurities was used to reduce COD load & oil problem.

CONSERVATION OF ENERGY AND WATER :-

The consumption of energy, water and resources is not only of ecology advantage but also key to sustainable development. Water intensive industry like textile has to conserve water, the fastest depleting necessary natural resource.

(a) Systematic water audit was carried out for water conservation.
(b) Training to the workers was given to close running hosepipe, etc.
(c) High pressure jet nozzle was used for screen washing.
(d) Spent scouring liquor was used twice.
(e) Rainwater harvesting was done.
(f) Selecting proper location of utility generation equipments with optimized lengths of utility lines.
(g) All utility lines were properly insulated.
(h) Correct type & size of steam traps were selected and they were installed correctly.

The consumption pattern was reduced by 40% in process house i.e. 1 Mt of printed fabric used about 10 liters of water instead of 16 liters. A few of the examples in the chart below will highlight the same.

No	Machine	Water consumption in Lt./day	
		Conventionally	After Modification
1.	Printing machine blanket washing	70,000	18,000
2.	Sanforizing blanket cooling water	80,000	3,000
3.	Replacement of jet dyeing machine	40,000	25,000
4.	Jet dyeing cooling water	20,000	Nil
5	Rotary machine blanket washing	1,25,000	50,000

In Surat when natural gas was introduced as a fuel, there was fresh thought of cleaner technologies. Energy conservation was not only a thought within the boiler house or insulation etc. but extended to alternative heating system. The best option was thought to heat at the point of need. This resulted in eliminating the thermic fluid heating system and replacing with direct heating system in the machines. This was possible as gas is a clean fuel.
The advantages of this system are summarized below.

UTILITY	UNIT	RATE (Rs/unit)	CONSUMPTION BEFORE CP (QTY/DAY)	CONSUMPTION AFTER CP (QTY/DAY)	SAVING Rs/Day	YEARLY SAVING Rs. in million (300 days)
Gas	m	4.25	3900	2400	6375	1.91
Electricity	Kwh	2.50	650	52	1495	0.45
Circulating oil	Lts	35.00	20	--	700	0.21
Soft water	Lts.	0.015	15000	--	225	0.07

Apart from economical advantage, this system resulted in following :-

(a) 50% reduction in air pollution as compared to gas fired thermo space; 95% compared to coil / oil fired thermo space.
(b) Safer technology; less fired hazard.
(c) Better production planning; Elimination of centralized heating system.

Though this was a project of high capital input (nearly 2.5 million rupees), the pay back period was less then a year.

(To be continued)

ORIENTATION PROGRAMME ON CLEANER PRODUCTION FOR TEXTILE SECTOR

MS, GCPC, Shri Bharat Jain making presentation for dissemination of scope of **Cleaner Production in Textile Process House** at the Textile Industrial Estate located at Balotra, Rajasthan. President of industrial association and members from industries of Balotra and Jasol attended the programme. They actively participated in the interactive session held thereafter and shared their problems with GCPC team and experts. Entrepreneurs admired the presentation and showed willingness in CP/CT by inviting GCPC to their units.

International conference on "Boiler Engineering & Technology" from November 24-26, 2004 at Kochi. For more details visit www.nsckerala.org

*** Papers/articles, case studies on cleaner production /technology are invited for forthcoming issues of newsletter**

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