News Letter On Cleaner Productin And Technology

GCPC - ENVIS

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Green & Clean Environment

GUJARAT CLEANER PRODUCTION CENTRE

Estd. by : Gujarat Industrial Development Corporation (GIDC)

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AWARD FOR EXEMPLARY APPLICATION OF THE CLEANER PRODUCTION IMPLEMENTATION IN SMALL AND MEDIUM SCALE INDUSTRY IN GUJARAT STATE

For the promotion and encouraging the Cleaner Production concept in Gujarat Government of Gujarat, Forests and Environment Department, vide Resolution No. : ENV-10.2004-61-Par, dated the 29th June, 2004 announced an award namely "Gujarat Cleaner Production Award" starting from the year 2004. A certificate of appreciation and a trophy shall be awarded every year to one industry in small or medium scale sector from the State. The winner of the award shall be selected by a committee comprising officials from DoEF, Industries Department, NCPC, New Delhi and GCPC.

The committee shall consider the applications received from the industrial entrepreneurs of Gujarat, who have successfully implemented the CP in their unit / industry and would decide the winner for the award.

A copy of resolution can be viewed on **www.gujenvfor.gswan.gov.in**

CLEAN TECHNLOLGY PROMOTION IN INDIA PROJECT - GCPC AS SERVICE PROVIDER

Clean Technology is one step ahead of Cleaner Production, which aims to the upgradation of existing technology of SMEs to improve the productivity and environmental performance.

"Clean Technology (CT) Promotion in India" project is a joint UNIDO-NCPC (National Cleaner Production Centre) project sponsored by State Secretariat for Economic Affairs (SECO), Switzerland with National Productivity Council (NPC), New Delhi as National Implementing Agency. The project would focus on the identification and resourcing of Environmentally Sound Technologies (ESTs) as suitable for SMEs.

Over the last decade, India has seen a considerable development of cleaner production and related series in national and state-level institutions. Most of the cleaner production options adopted to fall in to the no-lower investment categories. Recognizing that this will limit India's short term potential for cleaner production, the sate secretariat for economic affairs of Switzerland(SECO) and UNIDO has promoted the project for transfer of cleaner technologies (CT) in the year 2003. The purpose is to seek transfer of technologies not yet commonly used in India from Switzerland or the other OECD Countries. The technologies should be financial viable, environmental friendly and proven in these countries and suitable to the Indian industries. The project would also develop appropriate mechanism for technology assessment and transfer along with the demonstration of Techno-Economically viable technologies. Looking to the potential and industrial growth in Gujarat, the dyes and dye intermediates and textile sectors are selected for CT project for the year 2004.

It is a matter of pleasure for us to inform that Gujarat Cleaner Production Centre (GCPC) has been selected as Service Provider for the Dyes and Dyes Intermediate Sector of Gujarat. Under the same project GCPC is providing various services like CT Pre assessment, CT Assessments, Training , Information services, Financial engineering etc. GCPC officials have been trained by International Reference Centre (IRC), Switzerland for providing these services. The majority of the activities in the project will be assisted by IRC. IRC has established network of more then 100 countries, and it will help to transfer viable and proven technologies of developed countries that have been identified by Indian demand through the CT assessments.

Industries which are interested in identification of clean technology for their plant/process may contact GCPC for further guidelines. Identification of financial aid may be made available under the scheme "Assistance to technology up gradation" of state government.

Technical Article Series III

CLEANER PRODUCTION IN CHEMICAL PRODUCTION (CP IN CP)

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Total dissolved solid (TDS) in effluent is one of the parameter difficult to treat by conventional technologies. In presence of high TDS, even biological treatment becomes ineffective. Recent publication of Ministry of Environment and Forest on Charter of Corporate Responsibility for various industries has stressed on reduction of TDS.

Basically in dyestuff industries some salt formation is taking place during reaction and for water-soluble dyes, salt is added at the isolation stage to precipitate out dyes from solution. In some organic chemical industries, salt is formed during reaction. At the end of reaction, to separate out salt from reaction mixture, normally reaction mixture is drowned into water, the salts get dissolved and insoluble organic compound is taken out.

In one of the programme of GCPC carried out by GCPC , the prime attention was on TDS reduction. The unit is engaged in manufacturing of perfumery chemicals like benzyl acetate. The details of effluent generation is as under:

Quantity of effluent per batch	:	2478 litres.
Total Dissolve Solids	:	28 %
Chemical Oxygen Demand	:	More then 1.0 lakh mg/L.

It was tried to understand how this salt is formed. The detailed manufacturing process, material balance, chemical reaction and theoretical consideration were studied and are as under:

PRODUCTION DETAILS OF BENZYL ACETATE

A) Manufacturing Process :

It is divided into five stages.

Stage 1 : Acetylation

Benzyl chloride is reacted with sodium acetate in the presence of catalyst at 110-115oC temperature.

Stage 2 : Salt Separation

On completion of the reaction, water is added to dissolve the salt from organic mass. The organic and aqueous mass is transferred to the decanter.

Stage 3 : Decantation

The reaction mass is allowed to settle for four hours. The organic layer is separated from the aqueous layer and is collected and stored to further distill. The aqueous layer is going as effluent.

Stage 4 : Washing

The organic layer is washed with water and sulphuric acid is added to remove adduct formed due to the reaction of catalyst and benzyl acetate. At the end soda ash is added to neutralize the mass.

Stage 5 : Distillation

The organic mass is distilled to recover benzyl acetate. The lower boiling fraction from the distillation containing unreacted benzyl chloride is taken in the subsequent batch during reaction stage. The middle fraction is collected to recover the benzyl acetate. The buffer zone is collected separately and used during distillation in next batch. The higher boiling fraction is the residue.

D) Theoretical Consideration :

Sr. No.	Raw material	Mol. weight	Raw material consumed in kgs	Moles	Mole Proportion	Excess in kg
1.	Benzyl chloride	126.5	1610	12.7	1	-
2.	Sodium acetate	82	1200	14.6	1.15	156
3.	Catalyst	101	18	0.18	-	-

OBSERVATIONS :

1. Unit is consuming 156kg of extra sodium acetate per batch.
2. Per batch benzyl acetate formation is 1627kg, which turns out to be 85% of theoretical yield based on benzyl chloride.
3. During reaction almost 745kg of sodium chloride salt is formed, which is wasted in effluent.
4. Unit is consuming 1500 liters of water per batch to separate out organics from salt.

OPTIONS OF CLEANER PRODUCTION :

1. Quantity of sodium acetate used is in excess by 15%. Unreacted goes as TDS in effluent. It should be optimized.
2. During reaction sodium chloride is formed as byproduct. It should be recovered.
3. At the end of reaction, the entire mass is drowned into water to dissolve salt and the organic product, which is liquid in nature, is isolated by layer separation. Instead of this, the reaction mixture itself should be filtered in closed nutch to remove salt.
4. To remove traces of organics attached to salt, washing with little water should be given. Water will get absorbed by salt and remaining organics will come out.
5. This operation will eliminate layer separation and decantation stages.

The unit implemented the options and results are encouraging.

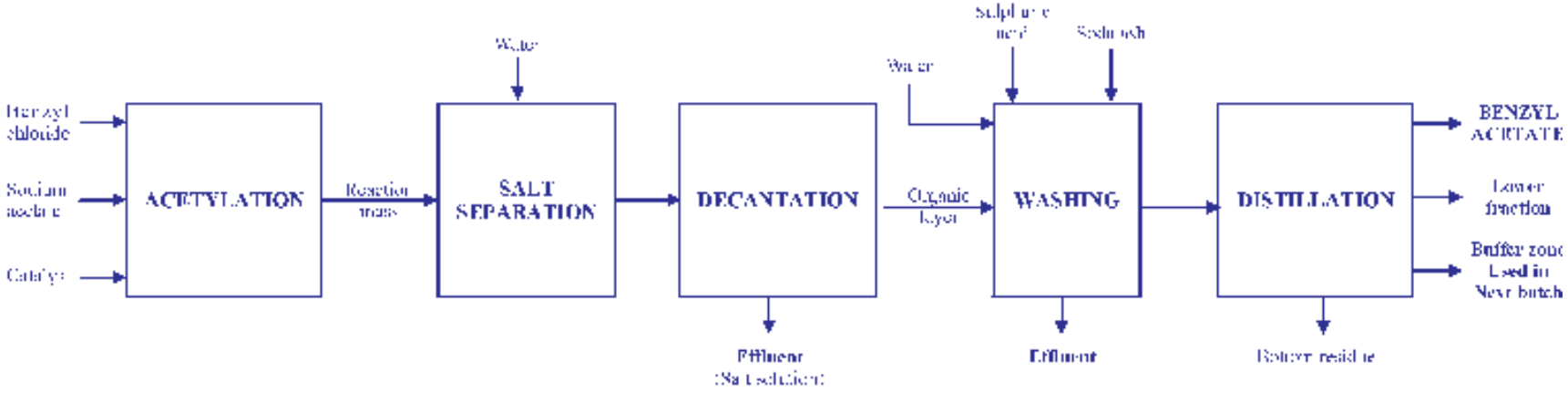
Flow diagram of process before and alter CP activity is given in figure 1.

The financial and environmental gains are summarized as under:

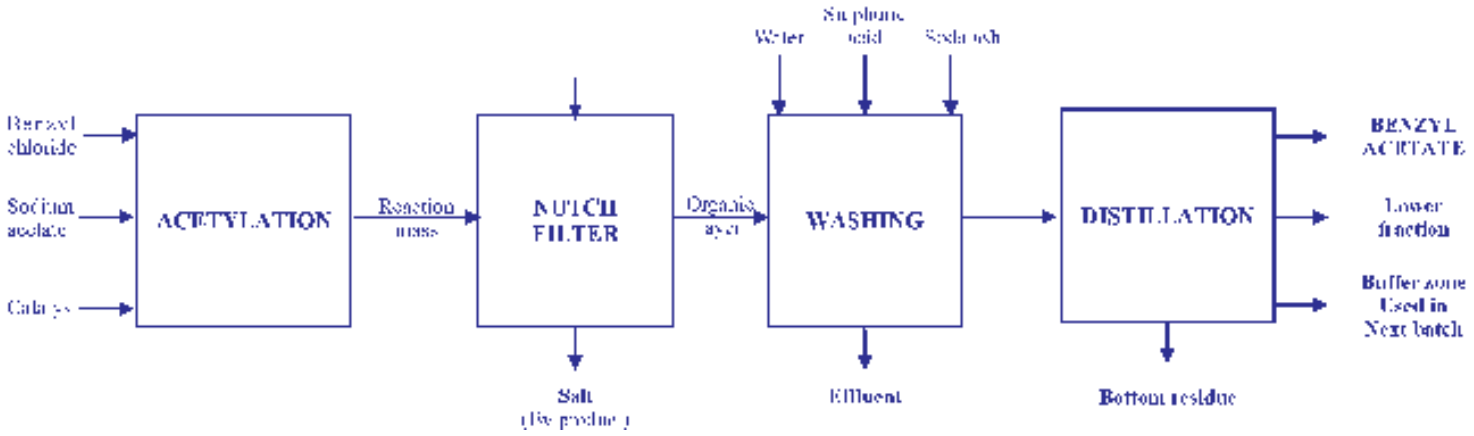
1. By product sodium chloride recovered. Earlier it was going as waste in effluent.
2. TDS problem of effluent got solved.
3. No effluent generation from this stage.
4. Use of sodium acetate reduced by 10%.
5. Yield of final product- benzyl acetate increased from 85% to 92%. Thus COD load from effluent got eliminated.
6. Financial saving for unit considerably high.

FLOW DIAGRAM OF BENZYL ACETATE

BEFORE CLEANER PRODUCTION



AFTER CLEANER PRODUCTION



CLEAN/CLEANER PRODUCTION CLEAN/CLEANER TECHNOLOGY - PART 1

R. Parthasarathy
CChem MRSC MCIWEM MEI AMIEMA and AMIChem^{E} (all UK)

Generic techniques of Clean Technology and Waste Minimization

Clean Technology focuses on prevention of waste and pollution, the minimization of energy consumption and on conservation of raw materials. The terms Clean Technology and Waste Minimization have been used synonymously in this paper though there are subtle differences. One view is that waste minimization involves production details to produce the same product from similar raw materials , with the aim of reducing waste to a minimum, while Clean Technology produces products from processes such that there is no detectable impact to the environment. Others say that WM involves retrofitting processes whereas CT implies installation of new processes. Realists consider Clean Technology is impossible or unattainable (we shall explain the thermodynamic and economic constraints at a later stage) and therefore, prefer to use the term Cleaner Technology. Cleaner Technology is concerned with the design and manufacture of intrinsically clean products by intrinsically clean processes. This requires strategic decision making and greater investment in improved future performance.

The Royal Commission on Environmental Pollution 1998 defined CT as a means of providing a human benefit which overall uses fewer resources and causes less environmental damage than alternative means with which it is economically competitive. CT is concerned with provision of services ,products and the processes with which these are provided and concerns with design, operation and management of activities , which avoid creating environmental damage at source. It is impractical to eliminate all sources of waste totally and so, it is strictly necessary to refer to the practical activities as being cleaner technology.

CP Clean or Cleaner Production is a conceptual and procedural approach specific to production, which as defined by the UNEP demands that all phases in the Life Cycle of a product or process should be addressed, with the objective of prevention or minimization of short term and long term risk to health and environment. It may be feasible to design a process which produces no emissions to air , no discharges to air and no solid waste but consumes enormous amounts of energy and raw material. This would certainly place the environmental burdens elsewhere, say at the power station.

The term Cleaner Production is now generally considered to be concerned with new ways of thinking about products and processes in the widest possible context, such that it becomes unnecessary to remain focused on EOP treatment activities. CP is concerned with closing the loop in production. All wastes in the production process should be minimized and the products in the end of the useful lives should be returned to the production process for recycling in new forms for the same original or different applications. Concept of CT demands an integrated approach to design , manufacture and use of products. The design is most crucial because it is at this stage, it becomes possible to minimize the environmental impacts through out the Life Cycle of the product .What ever the definitions may be and whatever the subtle differences are, it is important to adopt Life Cycle thinking to the provision of services using the products that are produced in the processes.

Source reduction methods are preferred over recycling methods since recycling implies that waste has been already generated in the processing or manufacturing activity. Once waste has been produced ,the intrinsic value of the raw materials has been lost and costs of disposal must be incurred

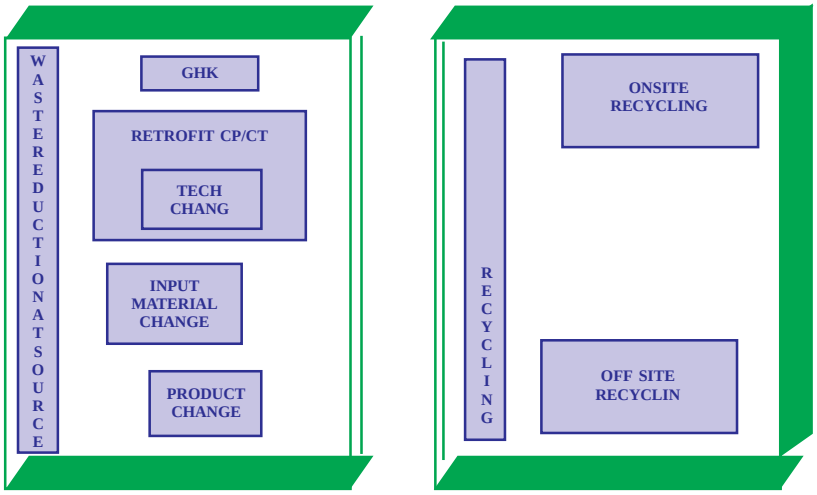
Clean technology is strictly a source reduction technique .

The other three waste reduction at source techniques

(please see figure 2) are

1 GOP General Operating Practice (not discussed here)
2 Technological changes
3. Input material changes and product changes/cleaner products

WASTE MINIMIZATION TECHNIQUES



Recycling can be on site or off site. Technological changes cover equipment and process modifications and include retrofitting. Retrofitting is modification made to existing equipment and processes and cleaner processes which are designed specially to minimize waste and pollution. Normally, retrofitting applies to production processes but in exceptional cases may apply to service functions well.

Input material changes : Any impurities in material inputs that become waste represent a potential hazard to the environment. By replacing potentially hazardous materials with less or preferably non hazardous material inputs , the impact on the environment can be reduced. Sometimes a material input change may not reduce the total amount of waste or may have an negative impact on the environment further along the production process. e.g a solvent based material replaced by a water based material may produce more waste water or increase effluent concentration.. Therefore, the entire production process has to be evaluated in order to achieve the best possible environmental option Examples of successful material inputs changes include the following

1 Replacement of PCB as dielectrics and fire retardants in electrical equipment

2 Replacement of chlorinated solvents by non chlorinated ones

3 Water or alkaline solutions in cleaning and degreasing operations

Product changes : Product changes involve altering the product in order to reduce waste during manufacture, use and disposal i.e during the product life cycle. These are among the more difficult waste minimization techniques to effect. Examples include changing the composition of the product or producing a substitute by manufacturing an alternative product to perform the same function. LCA Life Cycle Analysis is being increasing used to guide the design of cleaner products.

Recycling includes three classes :

1. Reuse within the same process. Here the waste material is reused as substitute for virgin material inputs within the same production sequence e.g. close loop system for recycling of water. This usually occurs on site
2. Reuse as raw material in another process. Waste material from one process is used as material input to another process. This can be onsite or off site, depending upon availability of equipment , machinery and process using contaminated waste in other operations not requiring high purity materials
3. Reclamation. Reclaiming recoverable and valuable materials from the waste stream The reclaimed material can be used raw material input or perhaps as a saleable product. It can take place on site or of site.More common types of recycling and principles thereof will be discussed in a separate article in the next issue.

Treatment and Disposal : Once waste prevention, reduction and recycling options have been exhausted, then it is important to treat the remaining wastes, effluents and atmospheric discharges are treated as effectively as possible i.e rendered harmless.

Disposal by incineration or landfill is the least preferable option and by definition it does not fall under waste minimization or CT.

(To be continued)

GCPC-ENVIS

WORLD ENVIRONMENT DAY (5th June'04)

A lecture on present environmental scenario and role of CP was arranged on 5th June'04 at Conference room of GIDC, Gandhinagar. Mr. Bharat Jain, Member Secretary and officials of GCPC made presentation on present environmental scenario and need of CP before HODs and Engineers of GIDC (Parent Organization) on the world environment day

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

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