

DINTEX DYECHEM LTD. (India)



ABOUT THE COMPANY

Dintex Dyechem Ltd. is located in the Vatva Industrial Estate in Ahmedabad in Gujarat State, India. Its main products are dye intermediates such as vinyl sulfone, 6-Nitro, 1,2,4 acid and SPMP as well as reactive, acid and direct dyes. It is a medium sized company that has about 225 employees and a turnover of some 200 million rupees (US\$ 4,464,200).

WHY GP?

BUSINESS SUSTAINABILITY

The Indian dyestuff industry has a poor environmental performance record. Hundreds of factories in the sector have been closed in recent years for pollution infringements. Dyestuff companies now face the challenge of improving their performance to respond to both tightening regulatory enforcement and the demands of an international market that requires good environmental practice. By implementing GP, Dintex hoped that it could both improve its own performance and demonstrate to the rest of the Indian dyestuff industry that improvements are technically and economically feasible.

PRODUCT IMPROVEMENT

The GP demonstration project at Dintex Dyechem focused on the production of vinyl sulphone. This chemical is one of the major dye intermediates exported to developed countries. It generates a revenue of US\$ 64 million a year for India. However, manufacturers are facing acute environmental problems associated with vinyl sulphone production. Dintex hoped that a GP approach would help it to resolve this challenge.

To implement GP, the company used the methodology described in the introductory chapter.



MAIN ISSUES

Vinyl sulfone is produced in a batch process that takes about five days to complete. The four major stages in the production process are sulfonation, reduction, condensation and esterification. Equipment includes boiler and chilling plant and a thermic fluid heater.

A breakdown of the key stages and main inputs and outputs are illustrated in Fig. 1. The review of Dintex's manufacturing process highlighted the following main issues:

- The plant's electrical systems were generally under-loaded and not operating at optimal efficiency. Its steam distribution system was poorly maintained and leaky and its refrigeration system was inefficient.
- The plant's waste water treatment system — which comprises a neutralization tank, Neutch filter and clariflocculator and aeration, sedimentation and polishing tanks — was not adequate for the entire pollution load generated by the factory and needed to be modified.
- The plant was generating over 18.6 m³ of waste water per tonne of vinyl sulphone produced; 80kg of solid waste was generated per batch of vinyl sulfone (this comprised the impurities from the sodium bisulfite and insoluble matter present in the ice used in the production process). Gaseous emissions included HCl gas from the sulfonator, particulate emissions from the flash dryer and flue gases from the boiler.
- The plant's pollution outputs, inefficiencies and losses were attributed to:
 - Poor raw material quality (eg. impure sodium bisulphide and ice) and improper storage.
 - Poor training, housekeeping, operational and maintenance negligence, manual quantity estimation and poor monitoring.
 - Inadequate technology (eg. lack of hood on dumping vessel; inadequate HCl recovery system) and poor process and equipment design.

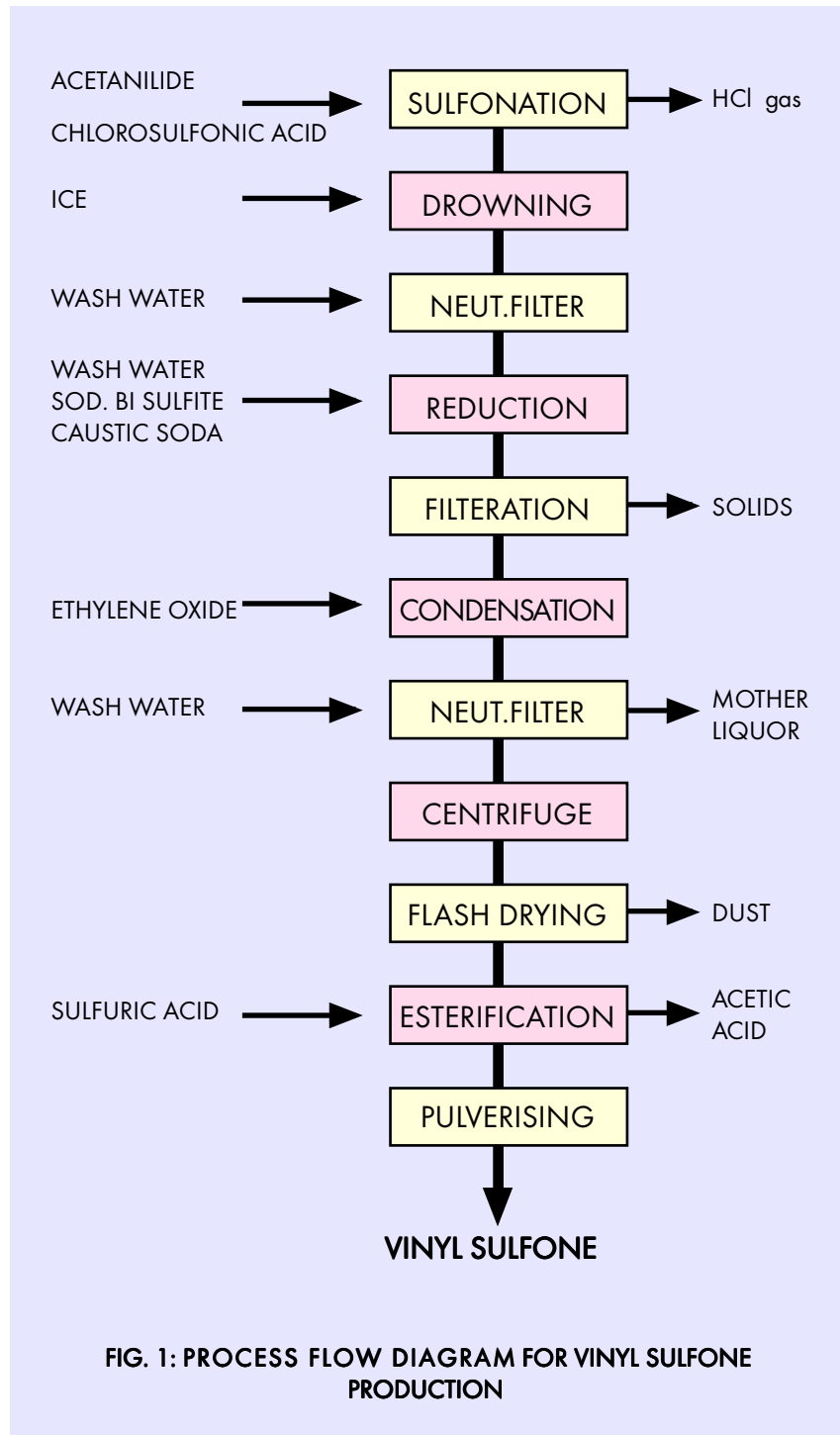


FIG. 1: PROCESS FLOW DIAGRAM FOR VINYL SULFONE PRODUCTION

GP SOLUTIONS/IMPLEMENTATION

As a result of the process review 66 potential improvements were highlighted. 36 were found to be technically and economically feasible, although half of these needed trials or laboratory studies before they could be implemented.

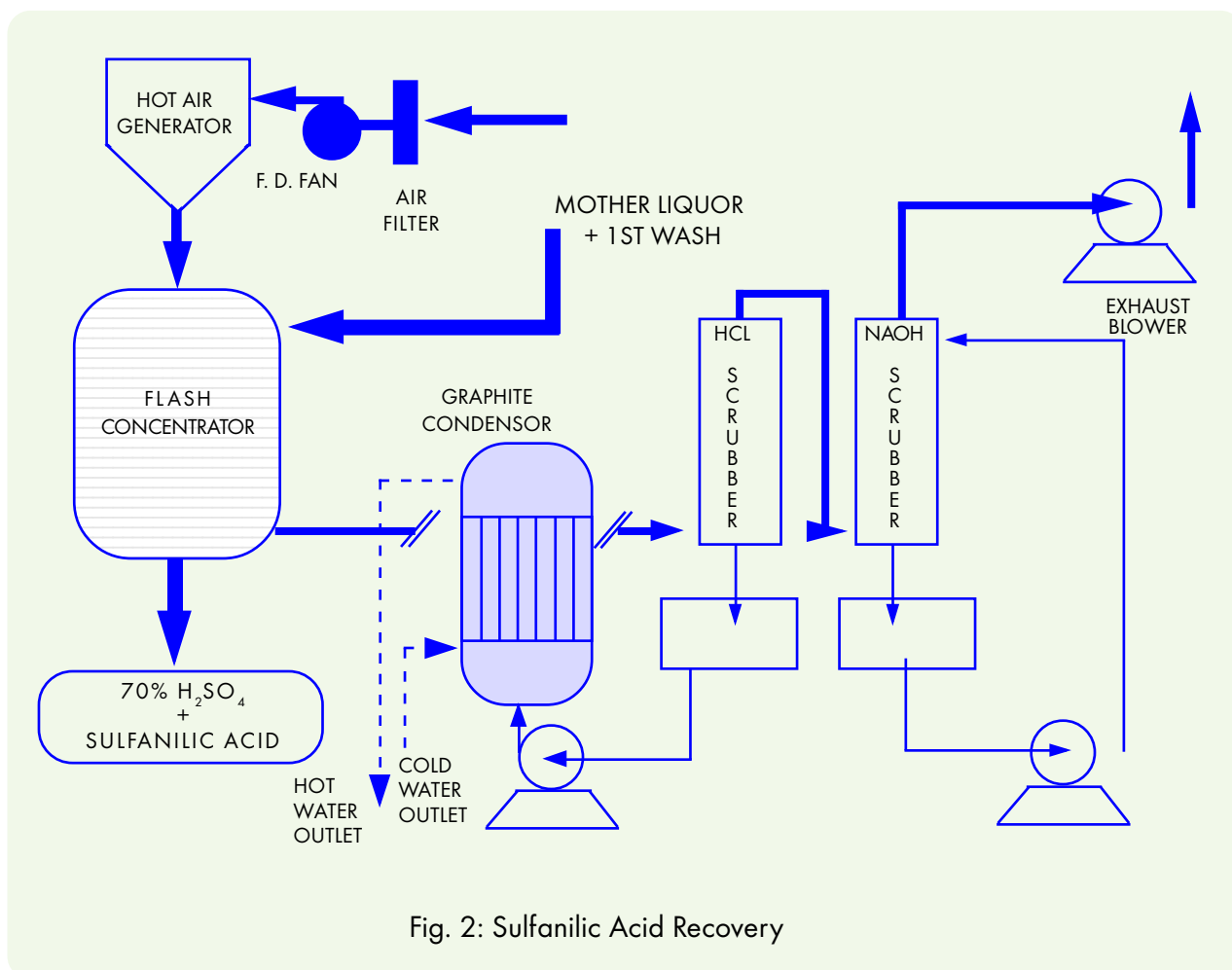


Fig. 2: Sulfanilic Acid Recovery

A number of different pollution treatment schemes were also analyzed, however it was found that treatment was not economically feasible and would generate large quantities of hazardous solid waste which would itself pose handling and disposal problems. Instead it was found that in-process pollution reduction and resource recovery represented the best options.

The improvements implemented included:

- Enhanced housekeeping, maintenance and monitoring. For example, the factory's steam distribution system was insulated and better process controls, such as temperature monitoring devices, installed.
- Pollution reduction through the retrieval and recycling of resources from waste. For example, sulfanilic acid was recovered from the mother liquor and salt from waste liquor (see fig. 2). Acidic mother liquor was retrieved for subsequent use in alum production in the paper industry.
- New technology development: For example, the HCl scrubber design was modified by installing a packed-bed type secondary stage to improve HCl recovery. The cake washing mechanism was also improved to reduce the amount of wash water needed.



BENEFITS OF GP

The implementation of the improvements outlined above generated substantial environmental and economic benefits. These included:

MATERIAL SAVINGS

Resource recovery per batch:

- 224 kg HCl.
- 200 kg sulfanilic acid.
- 8,800 kg acid.
- 7,200 kg of salts.
- 82 kg condensation product (equivalent to about 100 kg of vinyl sulfone).

ECONOMIC SAVINGS

This resulted in savings of over Rs.16 million (US\$ 357,136) a year — from an initial investment of some Rs 17 million (US\$379,457).

CONCLUSION

The Dintex GP project showed that a pollution prevention approach to environmental improvement can give significant benefits both in terms of production efficiency and profitability. The GP survey made it clear that the waste generated by dyestuff manufacturing requires complex and expensive treatment that produces many problems of its own. It also made it apparent that many of the outputs of the manufacturing process can be reused and thus represent a resource and income stream. In the highly competitive world dyestuffs market, Dintex's GP team concluded that any company that reduces its pollution load through a systematic program of pollution prevention and resource recovery will gain a substantial competitive edge.

“After implementing all the suggestions generated by the GP program, we will be able to meet the relevant regulatory standards. This was not possible earlier.

Now we are also getting wealth from the waste. In this way we are marching towards Green Productivity.”

**Mr. Dinesh S. Shah
Managing Director
Dintex Dyechem Ltd**

Video available for this case study from:

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