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Regional Activity Centre for Cleaner Production

MINISTERIO DE MEDIO AMBIENTE

Generalitat de Catalunya
Government of Catalonia
Department of the Environment and Housing

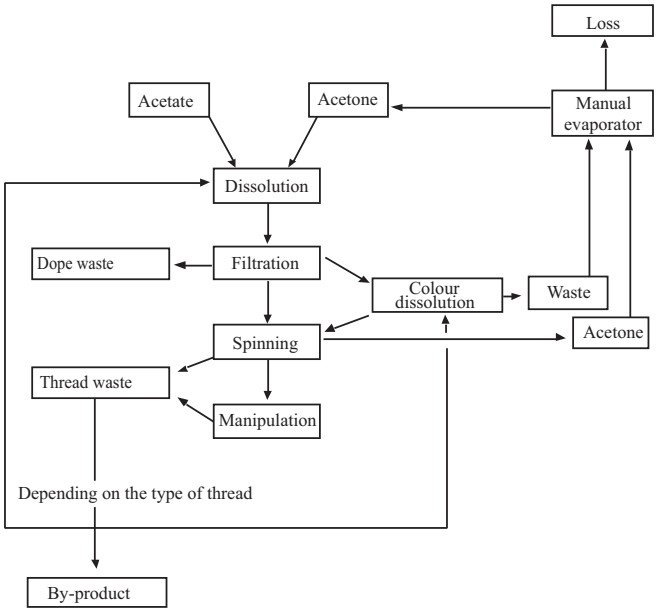
No. 37 Pollution prevention case studies

Minimisation of dope waste, a mixture of acetone and various types of thread

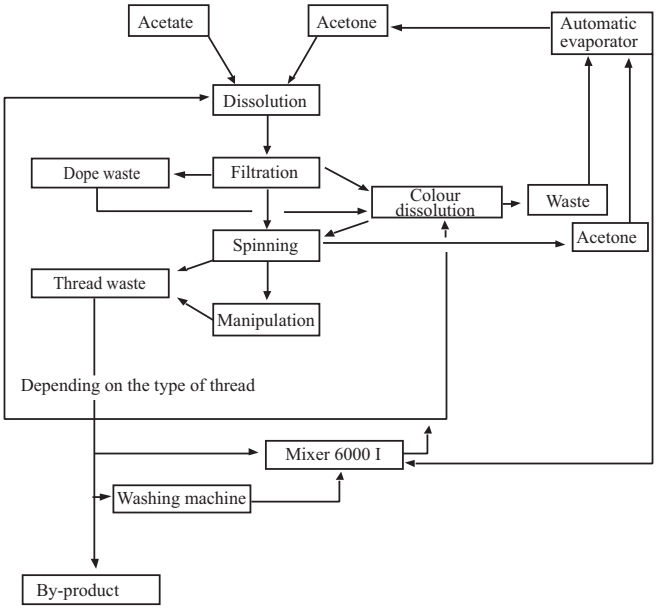
Company background	INACSA (Industrias del Acetato de Celulosa, SA). La Batllòria, Spain.
Industrial sector	Chemical and textile industry. Manufacturing and manipulation of cellulose thread.
Environmental considerations	INACSA manufactures synthetic fibres from cellulose acetate, the raw material, and from acetone, used as solvent. The manufacturing process consists of dissolving the acetate in acetone, filtering, colouring, extruding the mixture and manipulating the thread (i.e. twisting, warping and/or sizing). The acetone vaporised during the extrusion phase is collected by condensation, absorption and rectification and is then incorporated again in the dissolution phase. Along the process, no colouring waste is generated or wastewater from dyeing is discharged. Nonetheless, the process generates dope waste (cellulose acetate dissolved in acetone) during the dissolution phase, as well as acetone, from cleaning of the facilities and remaining manufacturing threads.
Background	Factors that induced the company to carry out the project are, on the one hand, the cost generated by external waste management and on the other, savings achieved by using these wastes as raw materials. The following actions are fruit of the activities developed by the company's Research and Development Department.
Summary of actions	The project consists of reintroducing dope waste (solid waste generated by the distillation of acetone used during the cleaning phase, and thread remains) in the manufacturing process. Each type of waste must be previously conditioned: - Dope waste can be used in the manufacturing of black thread. Thus, only mixing with pure dope and adding colouring agent is required. - Acetone used for cleaning the facilities is distilled and collected as raw material. Regarding the waste produced by acetone distillation (i.e. acetate, colouring and acetone), it is also used for the manufacturing of black thread, through an evaporator allowing the recycling of the product. - Thread remains are separated in various categories depending on their characteristics: bright or matt, coloured or black, pasted or derived from a mixture of acetate with other types of fibres. They are then dissolved and filtered. - The remains of bright thread are dissolved in a mixer with acetone and used as raw material in the manufacture of dope. - The solution containing of black and coloured residual thread serves as raw material for manufacturing black thread. If the thread is coated, it must be washed previously in order to eliminate the glue. This process generates wastewater that is treated separately before it is sent to the wastewater treatment plant.

Diagrams

OLD PROCESS



NEW PROCESS



Balances

	Old process	New process
Consumption of raw materials		
- Cellulose acetate	1,577.4 t/y	1,512.8 t/y
- Acetone	192.1 t/y	186.9 t/a
- Energy	0 kWh/y	8,496 kWh/a
- Water	0 m^3/y	1,317 m^3/y
Waste generated	23,000 kg/y	3,000 kg/y
Process costs		
- Cellulose acetate	2.75 M €/y	2.64 M €/y
- Acetone	88,955 €/y	85,313 €/y
- Energy	0 €/y	282 €/y
- Water	0 €/y	258 €/y
- Labour force	0 €/y	32.508 €/y
Environmental costs		
- Waste management	2,464 €/y	390.6 €/y
- Treatment of wastewater	0 €/y	158.3 €/y
Total cost	2.84 M €/y	2.76 M €/y
Savings	82,509 €/y	
Investment	144,543 €/y	
Payback period	21 months	

N.B.: Balances only refer to the washing machine and the mixer

Conclusions

Thanks to this action, the company has achieved an 87% reduction of the generated waste and 85% of the remaining waste is recycled in the industrial process, with a positive impact on raw material consumption. Despite the increase in water and energy consumption, savings achieved in raw materials and costs associated with waste management prove that this action remains economically attractive. This company has also obtained a grant thanks to which the payback period has been kept under 21 months.

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

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