Intervening Technology/ Technique	**Technological Innovations in the Manufacturing Process of Phorate Technical.**

About the industry	M/s. PI Industries Ltd (PI) the Corporate office is located in Gurgaon (Haryana), with the R&D set up at Udaipur, and the manufacturing sites at Panoli near Ankleshwar (Gujarat State), and Jammu (J&K state).
Implemented Techniques/ Technology	**Before** • In the original manufacturing process, the reaction in step-II was carried out with aqueous 37% formalin solution and ethyl mercaptan. The un-reacted formalin goes to the effluent and increases the effluent load with high COD/TDS/TSS. **After** • In the new innovative process, the reaction in step-II is carried out with Para formaldehyde and Ethyl mercaptan in minimum quantity of water (recycled from the aqueous layer of the previous batch). The de-polymerisation of Para formaldehyde takes place in-situ to generate formalin for the reaction with ethyl mercaptan and DETA (Diethylenetriamine). • After the reaction, two layers are formed and separated. The aqueous layer containing un-reacted Formalin and DETA is recycled for use in the subsequent batch. • The organic layer containing 8-10% un-reacted DETA is neutralized with caustic lye to generate an aqueous solution of Sodium DETA, which can be used in the manufacturing process for another PI product called Ethion. After washing and subsequent drying, the organic layer gives Phorate of 95% purity.

Benefits	**Before**	**After**
Economical	• Increased raw material consumption due to inefficient recovery of un-reacted raw material from the effluent. • Un-reacted DETA remained in the effluent.	• Recycle and re-use of the formalin and DETA which minimize the fresh raw material consumption. • The aqueous solution of Sodium DETA, generated by neutralizing the un-reacted DETA in the organic layer, can be used in the manufacturing process for another PI product called Ethion. This prevents the wastage of DETA as a raw material.

	• Aqueous Formalin solution was used in excess amount and therefore, unreacted formalin directly sent to the effluent treatment plant for further treatment of the effluent without any recovery/reuse/recycle.	• New process replaces with the 37% aqueous Formalin solution with solid para formaldehyde. Smaller quantity is required than formalin. • It is also easier to handle small quantities of solid para formaldehyde rather than large quantities of aqueous formalin solution. • The new process resulted in an overall **cost saving of Rs. 10, 53, 12,500 per annum.**
Economical	• Increase the pollution load on waste water treatment plant due to un-reacted formalin and DETA remains in the effluent. It reduces the yield and purity of final products.	• 90% reduction in the generation of toxic effluent, through in-process recycling of waste streams.

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