

<b>Intervening Technology/Technique</b>	<b>Technological Innovations in the Manufacturing Process of Profenofos Technical.</b>	
<b>About the industry</b>	M/s. PI Industries Ltd (PIL), the Corporate office is located in Gurgaon, Haryana with the R&D unit at Udaipur, and the manufacturing sites at Panoli near Ankleshwar (Gujarat State), and Jammu (J&K state).	
<b>Implemented Techniques/Technology</b>	<p><b>Before</b></p> <ul style="list-style-type: none"> <li>● In the original manufacturing process, the reactions in step-II were carried out using an organic solvent (Acetone) and potassium carbonate. The molar yield of this step was only 85%.</li> <li>● The reactions in step-III were carried out with anhydrous sodium hydrosulfide (NaHS) in moisture free isopropanol as solvent.</li> <li>● The reactions in step-IV was carried out in the solvent medium of MIBK (Methyl Iso Butyl Ketone). The purity of Profenofos technical obtained by this process was only 89%.</li> </ul> <p><b>After</b></p> <ul style="list-style-type: none"> <li>● In the new innovative process, in reaction step – II, the organic solvent was replaced with water and Potassium carbonate, which is costly, was also replaced with 47% caustic lye. The resulting yield increased to 94%.</li> <li>● The reactions in step – III Anhydrous sodium hydrosulphide (NaHS) was replaced with Aq. 30% NaHS solution which is a by- product of another major product at PI Industries.</li> <li>● The reaction in step – IV was carried out in a purely aqueous medium, thereby greatly minimizing the use of the costly MIBK solvent. The new process also results in an average increase in yield of greater than 8% and increased purity of Profenofos technical to 94%.</li> <li>● The aqueous layer containing sodium bromide was also re-utilized to generate bromine, which is an input in step-I of the process.</li> </ul>	
<b>Benefits</b>	<b>Before</b>	<b>After</b>
<b>Economical</b>	<ul style="list-style-type: none"> <li>● All the solvents such as Acetone, MIBK, and Potassium Carbonate and Anhydrous sodium hydrosulphide were responsible for high COD load in the waste water hence difficult to treat. It reduced yield and purity of final product.</li> </ul>	<ul style="list-style-type: none"> <li>● Potassium Carbonate was replaced by cheaper 47% caustic lye. 100% reduction in the COD load in waste water.</li> <li>● Use of water in place of acetone and MIBK.</li> <li>● 30% Use of aqueous NaHS in place of anhydrous sodium hydrosulphide.</li> <li>● Use of 90% industrial ethanol in the</li> </ul>



		<p>place of costly anhydrous isopropanol. Increased yield to 89% to 94%.</p> <ul style="list-style-type: none"> <li>• Cost saving of Rs. 35,42,75,000 per annum, based on an annual production of 2000 MT.</li> </ul>
<b>Economical</b>	<ul style="list-style-type: none"> <li>• Acetone, Isopropanol and MIBK were used in the various manufacturing steps of Profenofos which was responsible for high COD built up in the waste water.</li> </ul>	<ul style="list-style-type: none"> <li>• Two solvents, namely acetone and MIBK, were completely replaced by water.</li> <li>• The third solvent - anhydrous Isopropanol - was replaced by 90% industrial ethanol.</li> </ul>
	<ul style="list-style-type: none"> <li>• Unrecovered sodium hydrosulphide increased the TSS in the waste water.</li> </ul>	<ul style="list-style-type: none"> <li>• Anhydrous sodium hydrosulphide (NaHS) was replaced with 30% aqueous NaHS, which is a process by-product from the manufacture of another major product at PI.</li> </ul>
	<ul style="list-style-type: none"> <li>• Aqueous layer of waste water with halogen compound such as bromine which was responsible for poisonous in fluid form and bromine vapour is destructive for the human skin, eyes and respiration tract.</li> </ul>	<ul style="list-style-type: none"> <li>• The aqueous layer containing sodium bromide was also re-utilized to generate bromine, which is an input in step-I of the process.</li> </ul>
	<ul style="list-style-type: none"> <li>• Increase the waste water and solid waste generation without any cleaner production options such as Reduce/Recovery/Reuse/Recycle.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in Waste water and solid waste through the CP concept.</li> </ul>

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