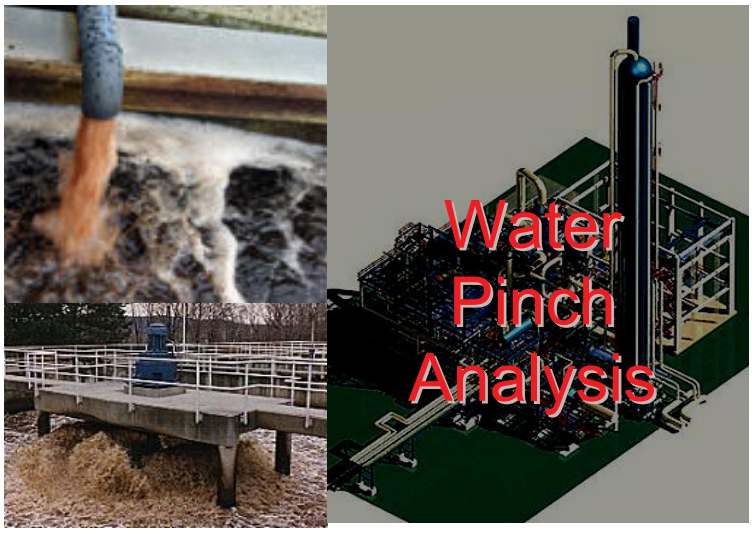
Water Audit and Wastewater Recycling Consulting Services

(Water Pinch Studies)



Cholamandalam MS Risk Services

An ISO 9001: 2000 Certified Consulting Firm

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1.0 Introduction

Critical environmental aspects of chemical processing industries are high demand for fresh water and generation of large quantities of organic and chemical bearing wastewater. Keeping in view of escalating need for safe disposal of wastewater, reducing treatment costs and wastewater recycling opportunities in the recent years, Cholamandalam MS Risk Services have mastered the art of water and wastewater audits in process industries and our experienced environmental, chemical and mechanical engineers have successfully demonstrated pollution prevention/wastewater minimization programs, diagnostic monitoring of wastewater treatment plants and wastewater recycling programs. The vast research experience of our environmental engineers in biological treatment processes amalgamated with the international exposure of Cholamandalam MS Risk Services' team will bring in unique, most reliable and economically feasible wastewater treatment solutions even for the most "**Difficult-To-Treat**" effluents.

Objectives of Water and Wastewater Audit

- To study the industrial processes and clearly map the water demanding centers
- To study water and wastewater flow network
- To establish wastewater flows during normal, peak, process upset, cleaning and other maintenance operations
- To characterize the wastewater steams through a rigorous sampling and analytical program
- To explore various pollution prevention and wastewater minimization programs
- To explore various water recycling opportunities
- To assess the performance of the existing wastewater treatment plant
- To develop a comprehensive report that can support the Water Pinch Analysis.

2.0 Overview of Water Pinch Analysis and Water Conservation Programs

Due to ever raising stress on water resources in the region and increasing water tariff in the region, water conservation and wastewater reuse and recycling programs are proven to be more economical in the recent past. Simultaneously, the dynamically changing environmental regulations in the Indian context, the need for reducing the wastewater discharges into the environment through wastewater reuse and recycling programs is becoming more significant in the process industries.

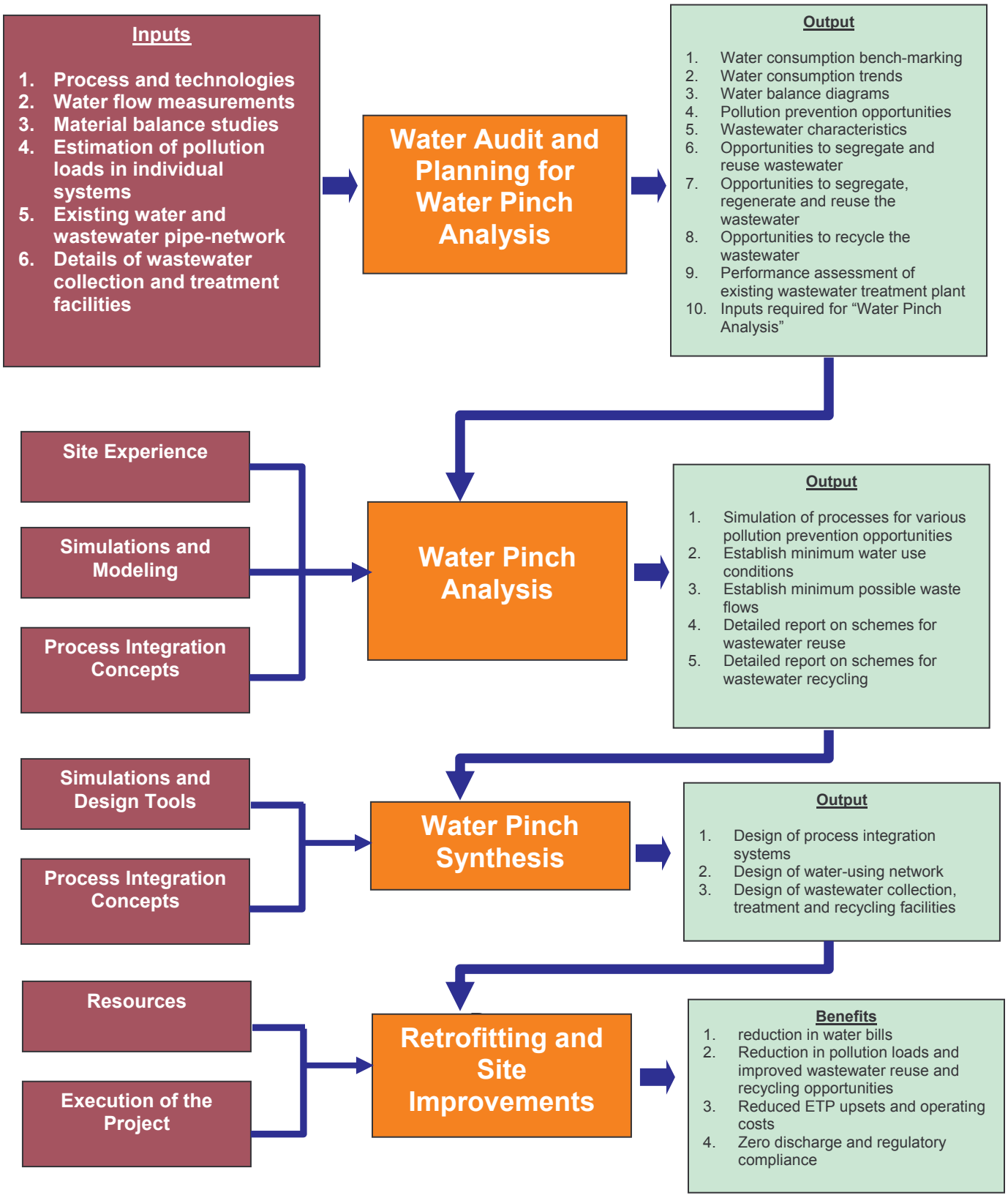
Process integration (PI) is an efficient approach that allows industries to increase their profitability through reductions in energy, water and raw material consumption. Among the PI, Pinch Analysis is most widely used technique due to its simplicity of underlying concepts and especially spectacular results it has shown in numerous projects in USA and Europe (NRC)[1].

Water Pinch Analysis (WPA) originates from the concept of heat pinch analysis. WPA is a systematic technique for reducing water consumption and wastewater generation through integration of water-using activities or processes. WPA was first introduced by Wang and Smith[2]. Since then, it has been widely used as a tool for water conservation in industrial process plants.

Techniques for setting targets for maximum water recovery capable of handling any type of water-using operation including mass-transfer-based and non-mass-transfer based systems include the source and sink composite curves and water cascade analysis. The source and sink composite curves is a graphical tool for setting water recovery targets as well as for design of water recovery networks. An overview of the Water Pinch Analysis studies is presented in **Figure 1**.

[1] *Natural Resources, Canada - Pinch Analysis for the Efficient use of Natural Resources*
[2] *Wang, Y. P. and Smith, R. (1994). Wastewater Minimisation. Chem. Eng. Sci. 49, 981–1006.*

Figure 1: Implementation of Water Pinch Studies



Water conservation programs are implemented in four phases and they are:

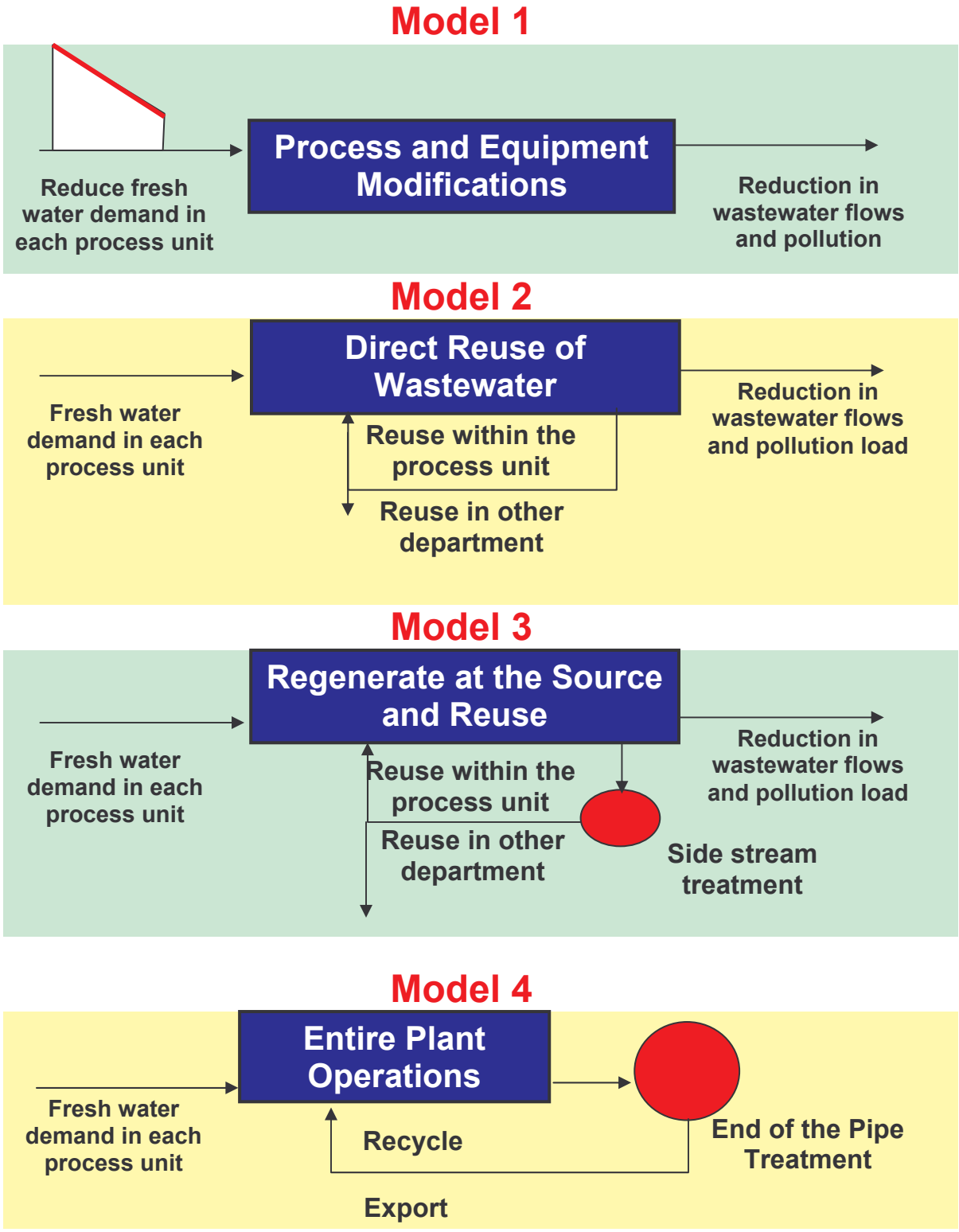
Step 1: **Preliminary studies and planning for Water Pinch Analysis** – This includes, mapping of water demanding centers, water and water flows and characterization, water and wastewater balance, pollutant transfer and transport in the entire water circuit, mapping of water and wastewater pipe network, review on the pollution prevention opportunities, review on the wastewater treatment, adequacy and performance and developing a report addressing all the inputs required for a detailed Water Pinch Analysis.

Step 2: **Water Pinch Analysis** – Detailed study on the process level water demand, bench-marking, wastewater characterization, simulation of processes for various pollution prevention opportunities to establish the most likely possible reduction in waste consumption and wastewater flows, investigate the costs and benefits associated with wastewater reuse, regenerate and reuse and recycling programs in the plant. Basically four types of models would have to be studied (**Figure 2**). Develop a detailed report presenting the process integration requirements, pollution prevention programs, wastewater segregation systems, wastewater reuse and recycle programs within the facility and detailed cost benefit analysis statement.

Step 3: **Water Pinch Synthesis** – Design a water-using network that achieves the identified flowrate targets for fresh water and wastewater through water reuse, regeneration and recycling. This includes process equipment modification schemes, redesign of pipe-network and design of wastewater collection, treatment and recycling facilities

Step 4: **Retrofitting** – Modify an existing water-using network and wastewater collection and recycling systems.

Figure 2: Water Conservation and Wastewater Reuse/Recycling Models to be Considered under the Water Pinch Study



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