sweet swiss energy research for the energy transition

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Decarbonizing Swiss Pulp and Paper Industry

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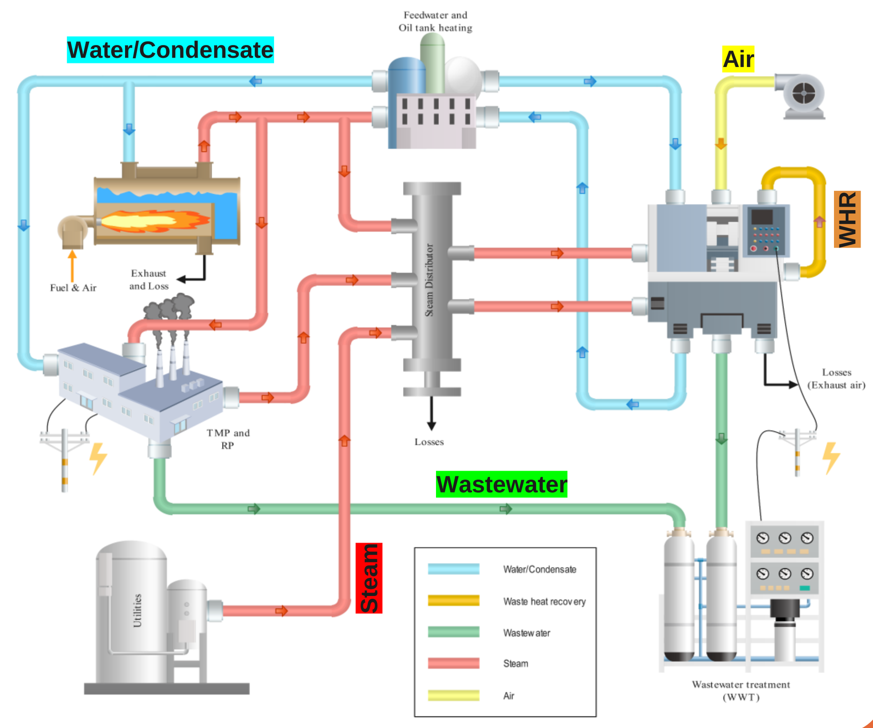
Goals

1. Assessing Energy-Saving Opportunities at Each Site
2. Conducting Pinch Analysis for Heat Recovery Potential
3. Minimizing Utility Usage
4. Prioritizing Electrification in Processes and Utilities
5. Evaluating High-Temperature Heat Pump Integration

Problem

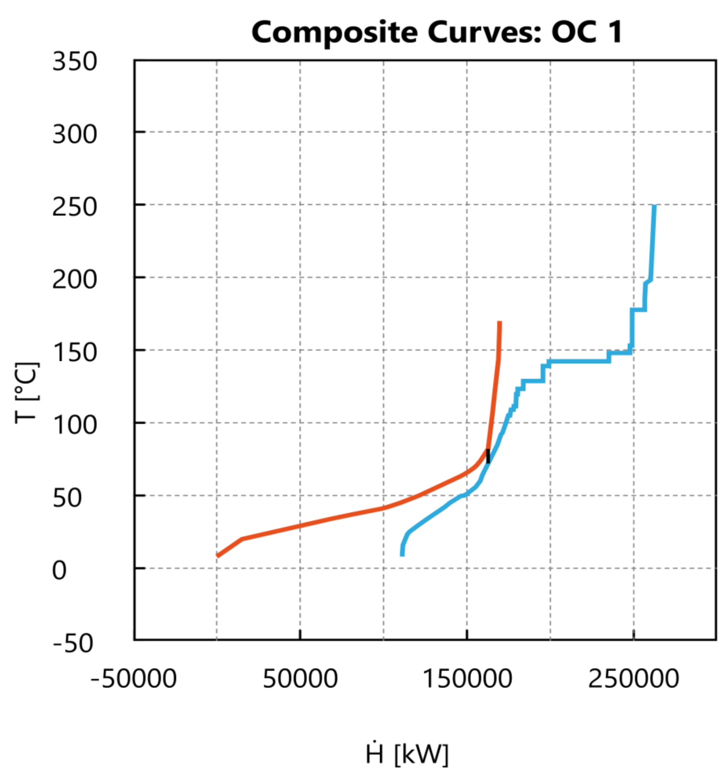
- Unlocking Heat Recovery Potential in Paper Manufacturing Industry
- Analyzing Heat Demands and Optimal Temperature Targets
- Evaluating the Viability of Maximizing Heat Recovery
- Assessing the Integration of High-Temperature Heat Pumps
- Cost-benefit analysis of Energy Retrofits and Upgrades

Overview of Perlen pulp and paper production site

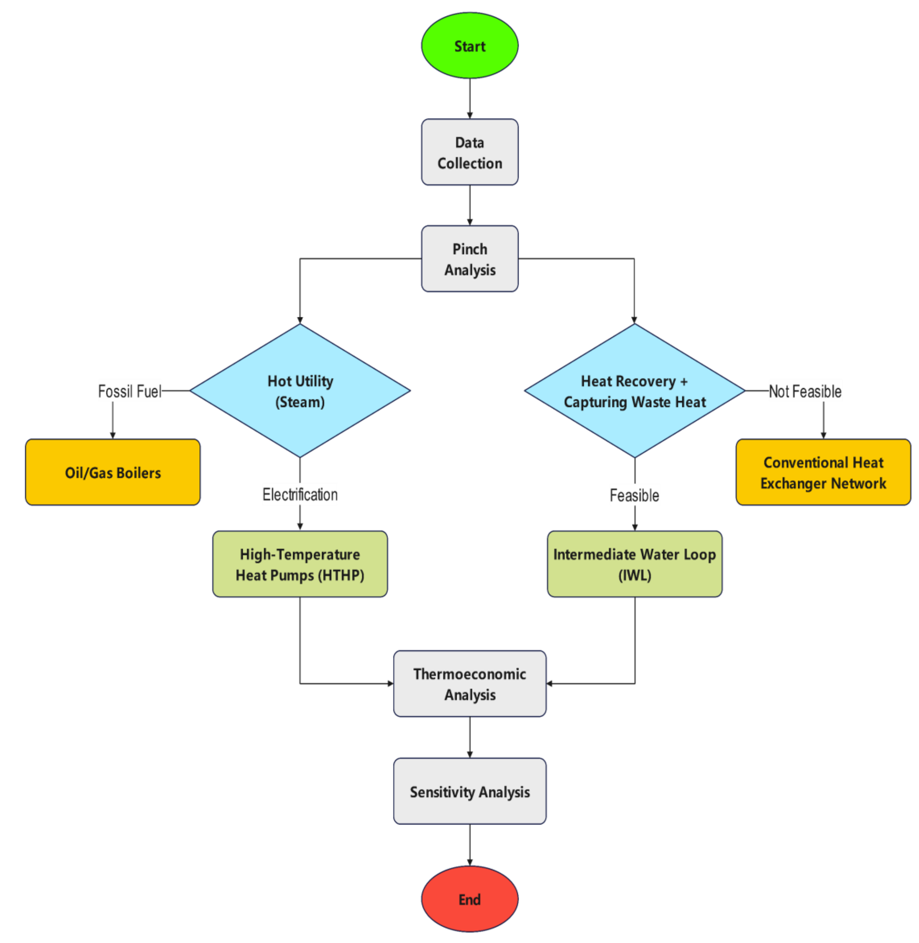


Introduction

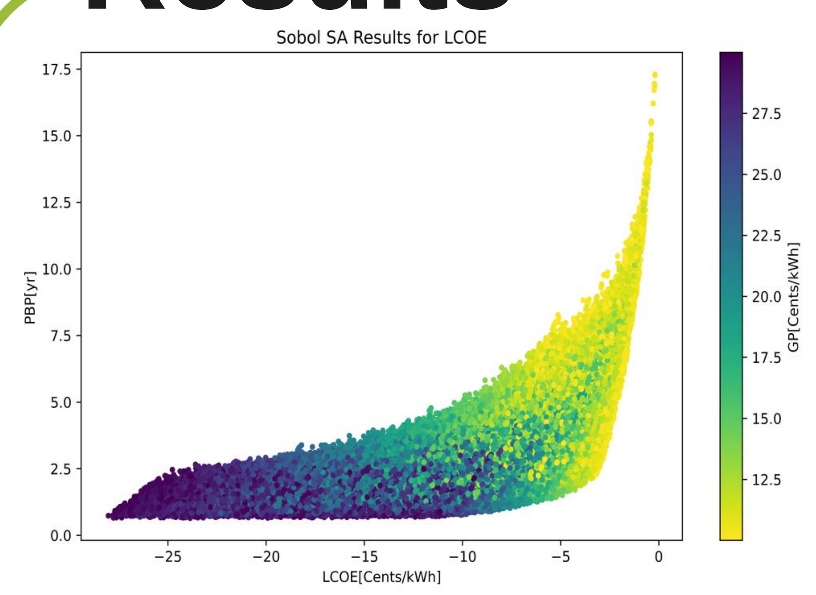
- **Industry's Share:** 19% of Switzerland's Final Energy
- **Pulp & Paper's Slice:** Roughly 9% of National Industrial Final Energy
- **Rising paper demand:** Makes decarbonization more challenging & urgent
- **Dominant Duo:** Model AG & Perlen Papier produce 90% of Swiss Paper
- **Pinch Analysis:** Shows potential of energy savings in paper mills
- **Heat Recovery Opportunity:** Potential of 58 MW identified
- **Demand vs. Waste acc. to Pinch Analysis:** 93 MW Needed, 111 MW Waste Heat Recoverable from 48℃ to Ambient (cooling needs)
- **Steam Efficiency:** 150℃ Steam fulfilling over 85% of Demand

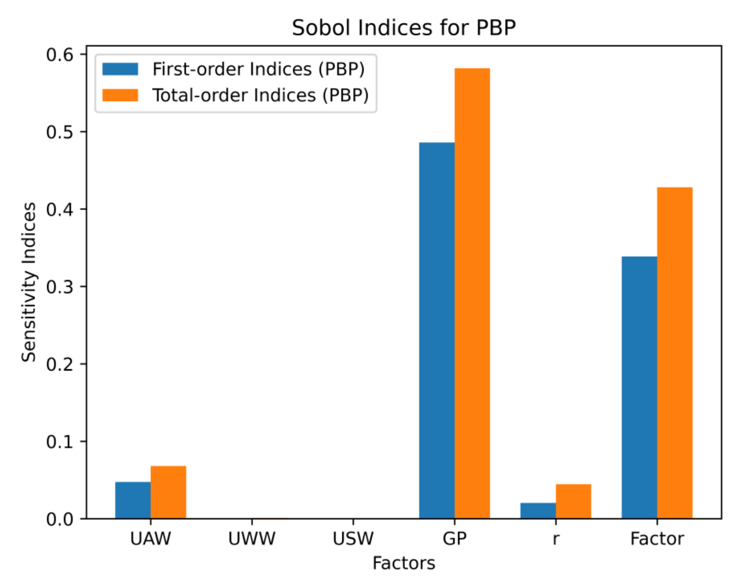


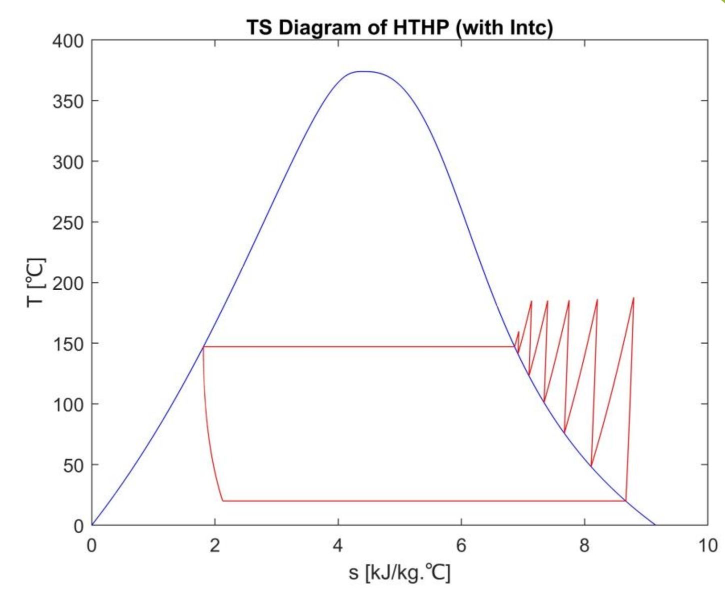
Method

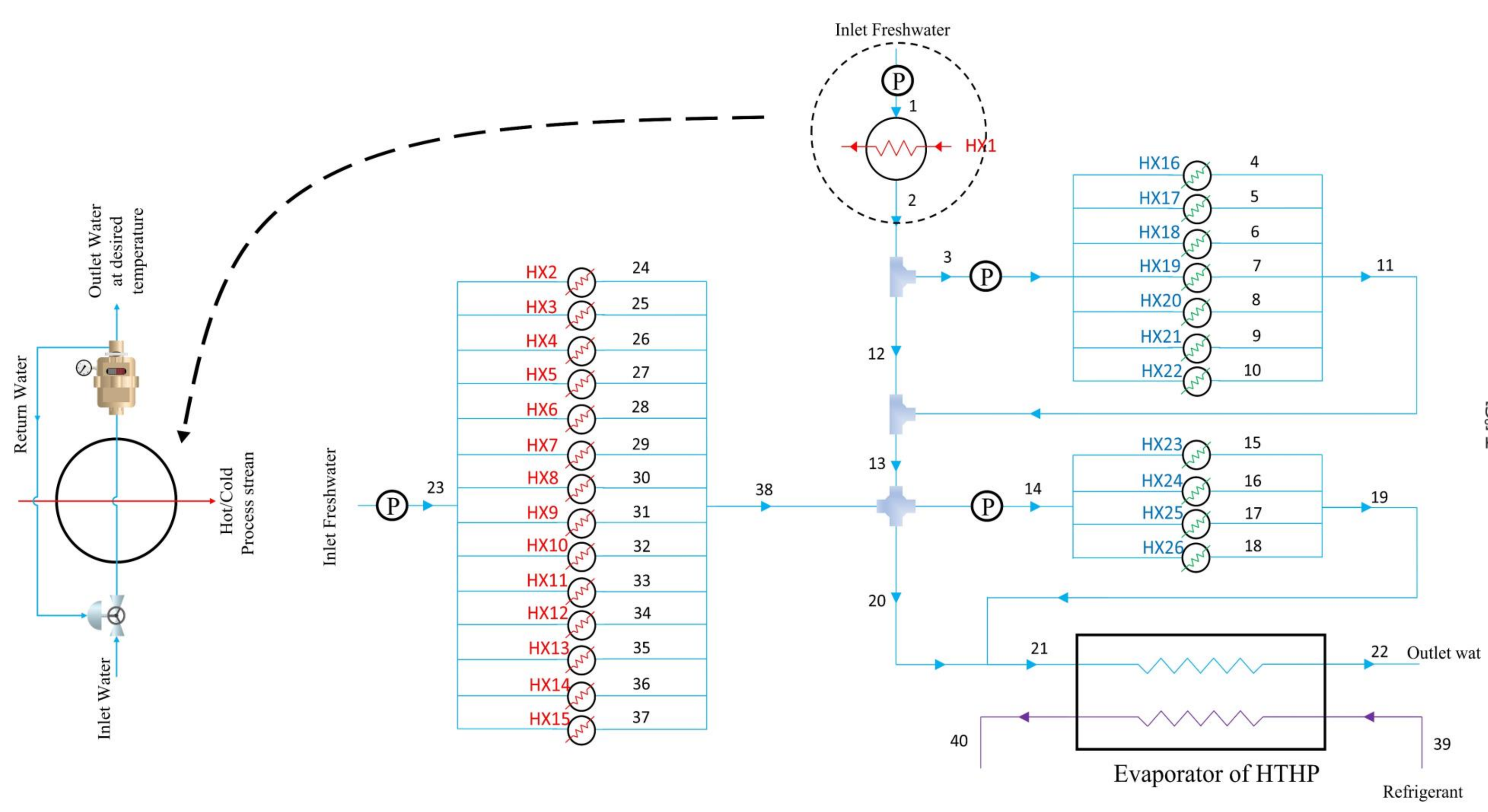


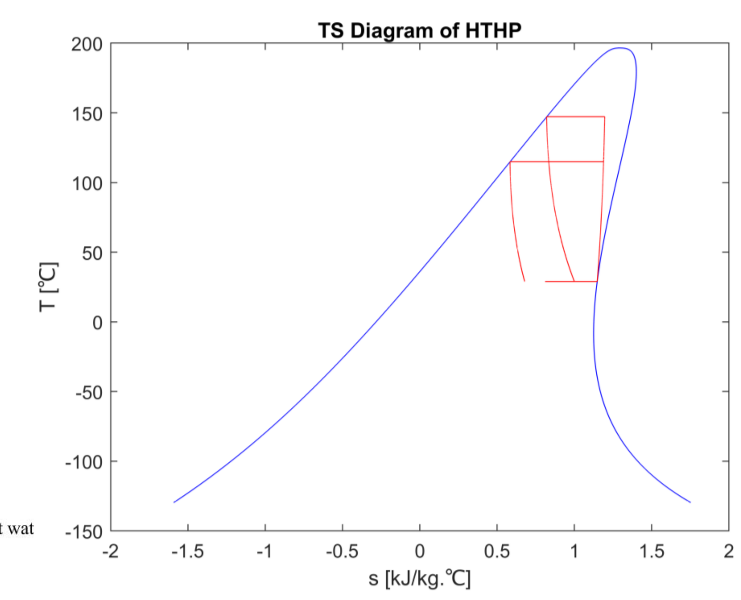
Results

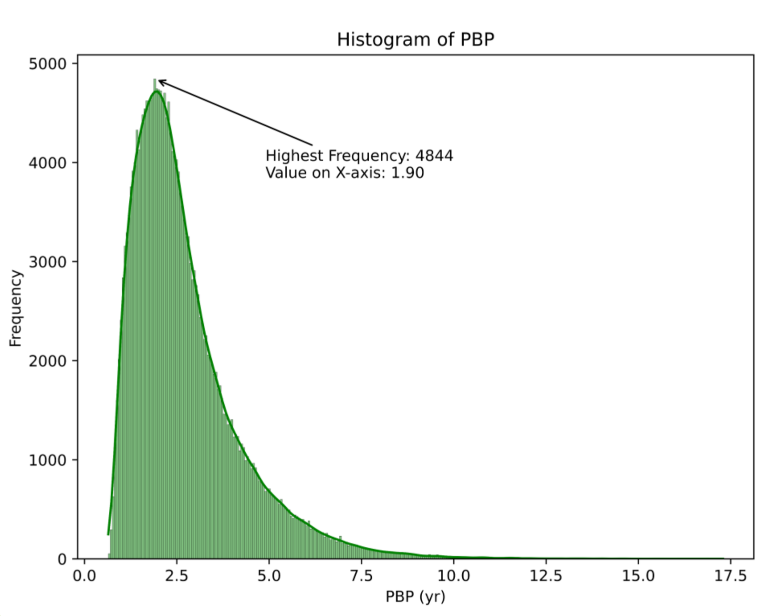


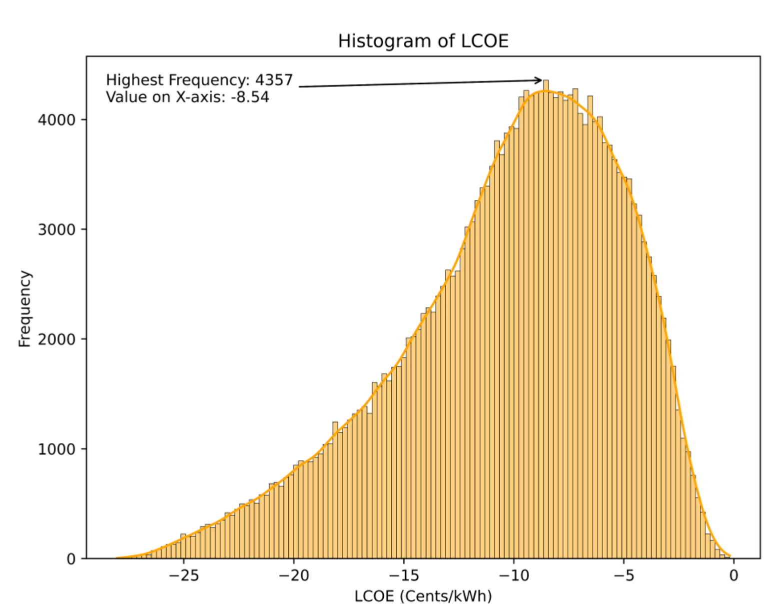


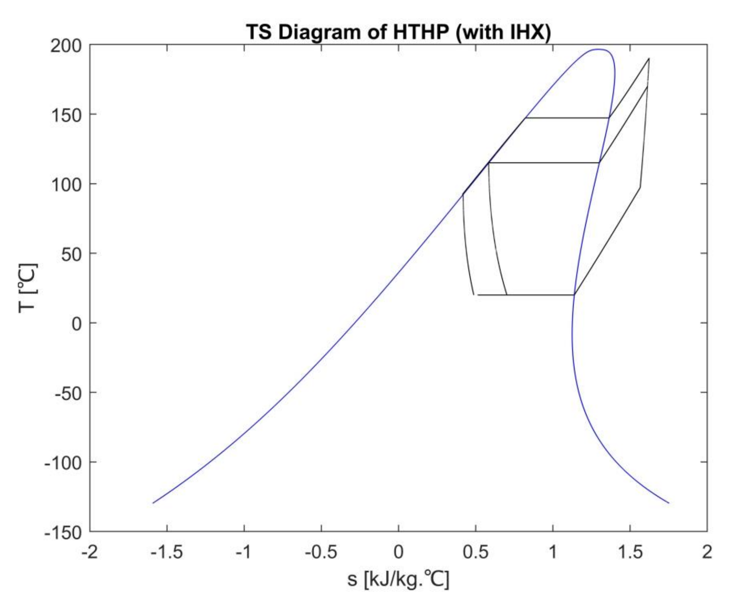












Conclusions

- Pinch analysis reveals up to 39% of heat demand can be met through heat recovery.
- PBP for the IWL is 1-2 years, while for the entire system, it extends to 5 years.
- Full system adoption cuts final energy demand by 39% and CO_2 emissions by 96% (-215 kt CO_2).
- PBP for the IWL is highly sensitive to gas price and the cost of heat exchangers.
- HTHP with Internal Heat Exchangers and/or Intercoolers are optimal for the paper industry.
- Approx. 30 MW waste heat can be upgraded for thermal grids using market-available HP.

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