Directions for the implementation of operational efficiency projects

Analysis and resolution of constraints (Debottlenecking)	• Identifying technological limitations and losses • Developing measures to eliminate them
Pinch analysis	• Optimization of flow recovery schemes • Improving energy efficiency
(Peer review)	• Detailed assessment of projects and technical solutions • Justification of the quality of decisions made
HAZOP, LOPA, risk assessment	• Identifying Unacceptable Risks • Preparing Risk Management Activities
RBI, RCM, RCA	• Ensuring production reliability and stability • Optimizing repair and maintenance cost

Analysis and resolution of constraints Debottlenecking

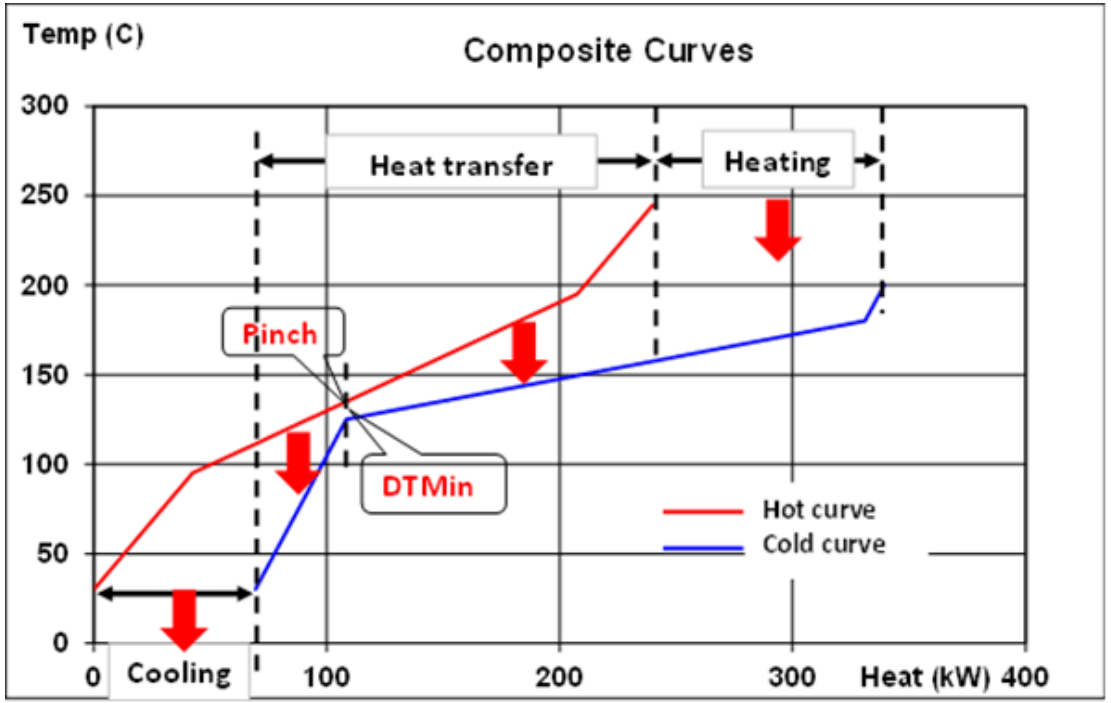
Includes the collection of production data and identification of limiting factors (processes, equipment, raw materials), their elimination to reduce costs, losses, increase the yield of final target products, and improve quality.

- **Identification of limitations:** analysis of critical areas such as air separation, syngas preparation units, Fischer-Tropsch synthesis reactor, and auxiliary equipment
- **Process optimization:** modeling of individual units of equipment and/or the entire production as a whole
- **Event Development:** change of technological operating modes, replacement or improvement of critical equipment,

Digitalization and software products:

- PIMS
- Any Logic

Pinch analysis



An energy optimization method based on thermodynamic flow analysis to maximize internal heat recovery. It allows for determining the minimum required flow rates for hot and cold flows, reducing their consumption and capital investment in equipment.

- **Definition of "pinch point":** Finding the minimum temperature difference dividing the process into zones, which allows us to identify the limits of energy efficiency.
- **Heat recovery:** analysis of hot streams (e.g. Fischer-Tropsch synthesis products) and cold streams (feedstock, reactors) for the use of waste heat within the system.
- **Economic effect:** Reduction of operating costs for external energy sources and optimization of heat exchanger area.

Digitalization and software products:

- Aspen Energy Analyzer
- Super Target (KBC)

Peer review

Critical evaluation of technologies or production projects to confirm technical validity, optimize processes and assess economic efficiency,

- **Technical assessment:** analysis of the efficiency of technological processes, catalysts, and quality of final products
- **Economic assessment:** analysis of capital expenditures, feasibility and effectiveness of investments, profitability, and payback periods
- **Risk assessment:** study of equipment reliability and production safety.
- **Stages of implementation:**
    1. Expert selection: engaging independent specialists in various disciplines
    2. Data collection and analysis: process flow diagrams, material balances, and design specifications..
    3. Conclusion preparation: Preparing a report with recommendations for improvement or optimization.

HAZOP, LOPA, оценка рисков

Hazard and Operability Study (HAZOP) – A method for qualitatively analyzing the safety of technological processes. The goal is to identify potential deviations in system operation that could lead to accidents, threats to personnel, or reduced production efficiency. HAZOP is an international standard and is used at all stages of the production lifecycle: design, modernization, and testing of existing installations.

Layers of Protection Analysis (LOPA) - A safety assessment method that determines the adequacy of independent layers of protection to prevent severe consequences (explosions, fires, emissions). Scenario risk is calculated by comparing the frequency of the initiating event with the probability of barrier failure.

Goals:

- Safe operation of industrial facilities
- Elimination of excessive or false alarms
- Compliance with standards

Digitalization and software products:

- PHA-Pro
- PHA Works

Risk-Based Inspection, Reliability Centered Maintenance, Root Cause Analysis

Risk-Based Inspection (RBI) - A method of planning and managing maintenance in which the priority and frequency of equipment inspections are determined based on an assessment of the risk of failure. Applicable to **static equipment.**

Reliability Centered Maintenance (RCM) - The reliability-oriented maintenance methodology is applied to **dynamic (rotating) equipment.**

Root Cause Analysis (RCA) – a set of methods for finding the true cause of failures and developing measures to prevent recurring failures

Digitalization and software products:

- RBI: “GE APM” (Meridium), “D-RBI”
- RCM: “1C:ТОИР”
- RCA: “GE APM” (Meridium), ” 1C:TOIR ”