# INTEGRATION SOFTWARE

## OPTIMIZING HEAT RECOVERY AND REDUCING WASTE HEAT GENERATION IN INDUSTRIAL PROCESSES

INTEGRATION is a state-of-the-art software package that helps optimize heat recovery and reduce thermal energy use in industrial facilities. INTEGRATION brings together powerful diagnosis and optimization capabilities, to quickly identify and deliver heat recovery solutions that improve the performance of heat exchanger networks and utility systems, while considering a range of operational and design constraints.
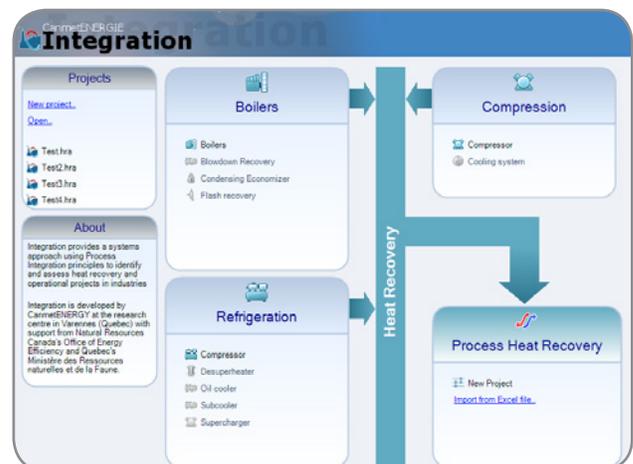
## THE CHALLENGE FOR INDUSTRY

Industrial processes use large amounts of thermal energy, which represent a significant portion of their operating costs. As a result, managing heat efficiently remains a priority for many industries, as it offers a cost-effective way of improving profitability and reducing gas emissions and effluents. However, finding the best design options in complex processes with numerous heating and cooling requirements is challenging. Certain key questions must be answered to develop energy-efficient solutions:

- What is the potential for improving the performance of heat recovery networks, and where are opportunities?

- What modifications can be made, considering practical design and economic constraints?

- How can utility systems be better designed and operated to reduce waste heat generation?

## THE INTEGRATION SOLUTION

To improve the energy performance of their processes, companies need to better understand how heat is being used across the process, rapidly identify areas of inefficient heat use, and pinpoint potential improvements to current systems, before investing in new heat recovery equipment.



INTEGRATION main page, showing the main modules for utility systems and process heat recovery

INTEGRATION is a flexible and easy-to-use software with powerful modeling and optimization capabilities that provides industry with a solution to quickly identify and evaluate cost-saving measures.

## KEY FEATURES

INTEGRATION allows the user to easily assess and improve the energy performance of industrial energy systems, including processes and utility systems. It is supported by a user-friendly graphical interface that allows for easy exploration of existing inefficiencies and retrofit opportunities to increase heat recovery and reduce waste heat generation.

INTEGRATION uses a systems approach and offers a range of powerful features.

### Retrofit Design of Existing Heat Exchanger Networks

INTEGRATION offers a flexible and interactive approach to analyze and optimize existing heat exchanger networks. With INTEGRATION, the user controls the type and number of modifications as well as design constraints, to develop practical and cost-effective solutions.

## USER-FRIENDLY INTERFACE

- Manually enter process and utility data or import it from Microsoft Excel spreadsheets

- Analyze several scenarios in the same file

- Easily model an existing heat exchanger network and quickly visualize modifications, thanks to the flexible drag-and-drop interface

- Rapidly specify each exchanger, heater and cooler in the network, using the exchanger editor

- Use the smart bar to diagnose and communicate data errors, so that no invalid data is used during the retrofit
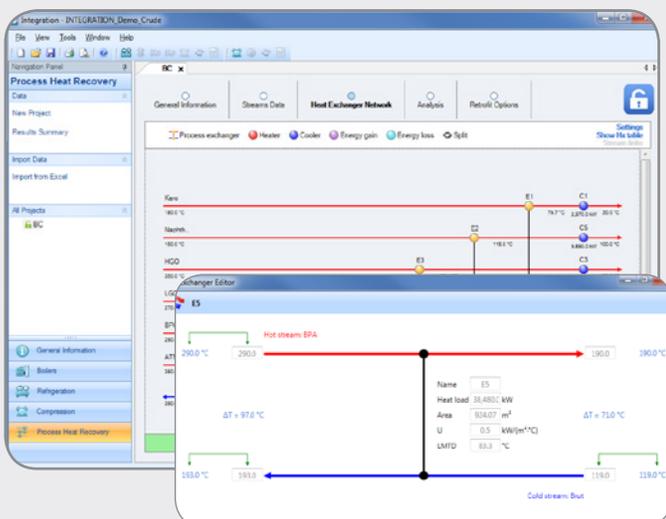


**Heat exchanger network (grid diagram) and editor for individual exchanger**
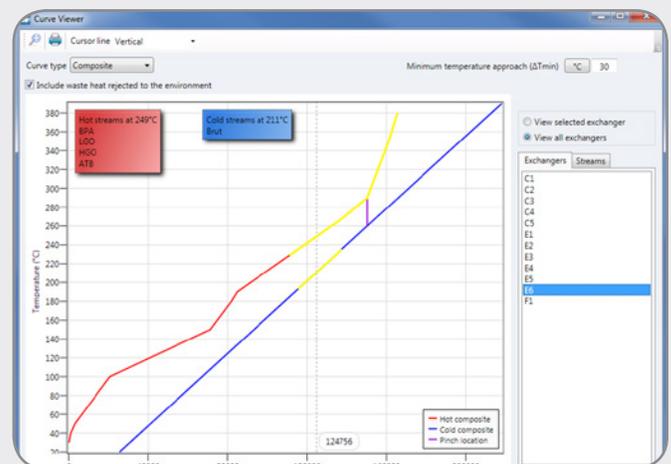


**Interactive composite curves, showing the process heating and cooling requirements, as well as existing heat exchangers**

# ANALYSIS FEATURES

- Analyze the energy performance of the network using Pinch analysis, including energy targets and scope for increasing heat recovery

- Visualize heat exchangers and process streams using interactive composite curves

- Identify and quantify thermal inefficiencies in the existing design

## Retrofit Design Features

- Automatic identification of areas in the network that limit heat recovery

- Robust optimization capabilities that help increase heat recovery, while considering a range of design and economic constraints

- Step-by-step retrofit approach that identifies the most beneficial changes, but leaves the user in control of the number and type of modifications

- Possible structural and operational changes supported by INTEGRATION include: adding a new exchanger, relocating an exchanger, splitting a stream, changing flows in split branches, and using the flexibility of some stream temperatures

- Possible development of energy-efficient heat recovery networks, while satisfying economic constraints, such as maximum investment or maximum payback period

- Summary reports that allow for easy comparison of various retrofit designs
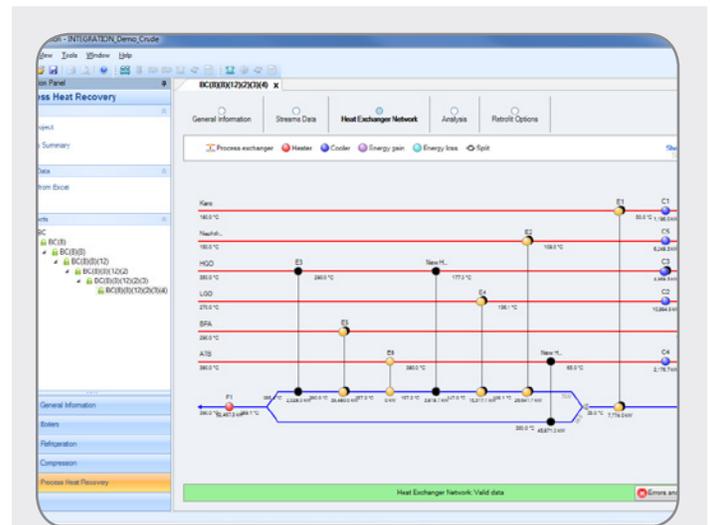


**Optimized heat exchanger network after several changes to increase heat recovery**

## Heat Recovery from Utility Systems

INTEGRATION incorporates separate modules for evaluating energy-efficiency measures in industrial boiler, refrigeration, and compression systems.

- Rigorous equipment models, supported by a library of thermophysical properties

- Flexible modeling approach for multi-equipment utility systems

- Easy evaluation of changes in operating conditions and typical heat recovery measures on energy consumption, operating cost, and $CO_2$ emissions
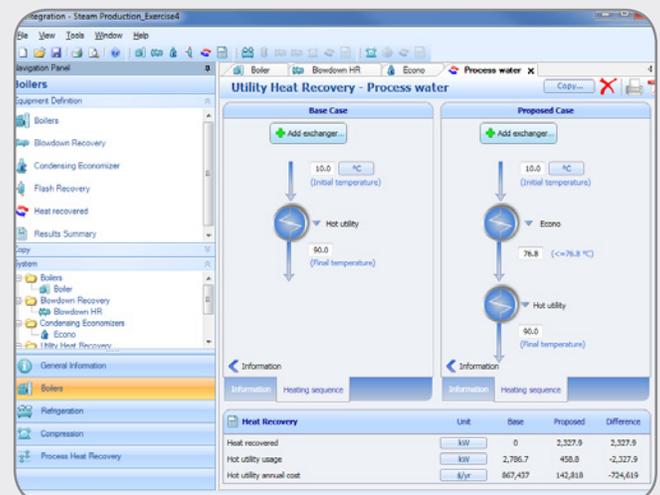


**Heat recovery from utility system for both existing and improved situations, side-by-side**

**CanmetENERGY**
*Leadership in ecoInnovation*

For more information on **INTEGRATION**, please contact us: **Integration@nrcan.gc.ca**

**CanmetENERGY's Systems Analysis Software**
To allow effective transfer to industry, CanmetENERGY is developing innovative software solutions that reflect the most recent advancements from our research activities.

**COGEN**, for maximizing revenues from cogeneration systems
**INTEGRATION**, for optimizing heat recovery in industrial facilities
**EXPLORE**, for improving process operation, using the power of advanced data analysis
**I-BIOREF**, for evaluating the economic viability and environmental impacts of biorefinery technologies