



# THE CWB INSIDER

A CLEARWATERBAY TECHNOLOGY INC. QUARTERLY

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## DATA SHOULD REPRESENT THE HEATING AND COOLING DEMAND OF THE PROCESS NOT JUST THE EXISTING EXCHANGER HEAT DUTIES

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In our last newsletter, we have established the argument that successful energy savings projects must consider the appropriate process modifications rather than simple heat exchanger network modifications. Consequently, the first step for an energy study is to extract the process information into stream data as input to the analysis process.

See Table 1 for a list of all the steps involved in an energy study.

Steps in an Energy Study	
STEP 1	Data Collection
STEP 2	Data Reconciliation
STEP 3	Base Case Utility
STEP 4	Targeting
STEP 5	Modification Idea
STEP 6	Project Evaluation
STEP 7	Detailed Idea Generation

In simple words, stream data should describe the energy requirement and/or surplus for all the process streams at any given temperature. These heating and cooling requirements are due to the specifications of various unit operations in the process that the process streams have to go through. To illustrate the difference in the correct extraction of "process data" and not just the "heat exchanger data", let us consider the following example:

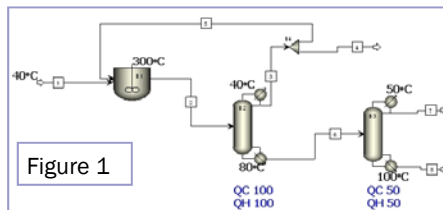


Figure 1

The process as shown in Figure 1 consists of a reactor where an exothermic reaction occurs. Unreacted reactants are recovered in a first distillation column, followed by product recovery and purification in a second column. As seen in the figure, there are two streams undergoing heat change, namely in the two reboilers. Because of the temperature difference, there is no heat recovery possible. Hence the hot energy target is thus 150 units and the cold energy target is 150 units. (See Figure 2)

Table 2

Name	Supply Temperature [°C]	Target Temperature [°C]	Enthalpy Change [MMkcal/h]
Column A Reboiler	79	80	100
Column A Condenser	41	40	100
Column B Reboiler	99	100	50
Column B Condenser	51	50	50

As described earlier, the stream data should represent:

- The energy requirement when transferring from one unit operation to another
- The energy requirement within the unit operation

With that in mind, let us re-examine the above ex-

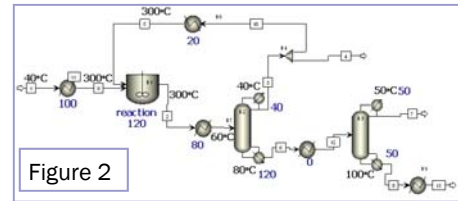


Figure 2

tracted data. To begin, the feed stream has a supply temperature 40 deg C. It should be determined where that number came from since it is most likely the storage temperature. This raw material is then needed to be transferred to the reactor at the reaction temperature specified to be 300 deg C. That means there is a temperature / enthalpy change required from its supply temperature of 40 deg C to 300 deg C specified by the reaction condition. Considering the enthalpy values of the raw material stream:

Name: Raw material  
 Supply temp: 40 deg C  
 Target temp: 300 deg C  
 Enthalpy Change: 100 MMkcal

Apart from the raw material stream going into the reactor there is also a recycle stream. This recycle stream comes from the top of the first column and the supply temperature is controlled by the column pressure and the separation specification.

**Continued on Page 2**

### SPECIAL POINTS OF INTEREST:

- **TECH TIP: "Correct data extraction in pinch study"**
- **Upcoming Training Courses**
- **Measurement and Analysis of Solid-Liquid Equilibrium using SLEEK EX**

COVER-STORY (CONTD. FROM PAGE 1)

Currently, the column pressure is fixed at 1 atm and consequently, the temperature is 40 deg C as specified by the separation requirement. Similar to the raw material stream the recycle stream also needs to be at 300 deg C going into the reactor. Similarly the reactor exit stream being at 300 deg C needs to be cooled down significantly before entering the

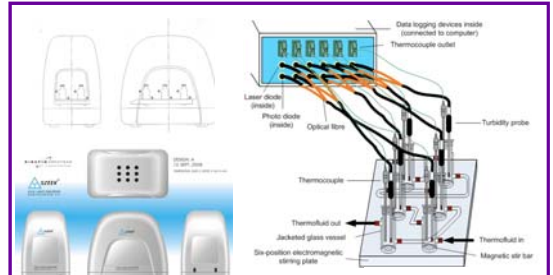
can be seen that there is room for energy integration.

The starting point for an energy integration analysis is the calculation of the minimum heating and cooling requirements (also called energy targets) of the system without specifying any network, as shown in Table 1. The next step is that of reconciling the data that has been collected before determining the energy requirements for the system, and also the heating and cooling characteristics of the process. That will be discussed in detail in the next issue.

Table 3

Name	Supply Temperature [°C]	Target Temperature [°C]	Enthalpy Change [MMkcal/h]
Column A Reboiler	80	81	120
Column A Condenser	40	39	40
Column B Reboiler	100	101	50
Column B Condenser	50	49	50
Preheat Reactor	40	300	100
Reaction Heat	300	299	120
Cool Reactor	300	60	80
Preheat Recycle	40	300	20

first column, as also reboiler exit streams from both the columns. The modified flow-sheet can be seen in Figure 2 whereas the modified stream data is seen in Table 3. It



SLEEK EX

Why is Solid-Liquid Equilibrium measurement important?

- Lack of literature data, e.g. new components
- Provide information for modeling
- Gather key information for process design

What does SLEEK EX have to offer?

- Capability of measuring SLE data and incorporating them into a thermodynamic model
- Supports the integrative approach which combines synthesis, analysis, and experimental activities

“A STRATEGY FOR EXCELLENCE IN PROCESS DEVELOPMENT”

Read our latest published paper in **Chemical Engineering Progress (CEP)**, an AIChE publication. The paper is published in **October 2008, Vol. 104, No. 10, pp 48-56.**

The paper talks about the workflow to integrate various process development activities and identify practices that facilitate the process development. The authors talk about the layered approach in describing this process development workflow.

UPCOMING TRAINING COURSES

Date	Venue	Title	Registration
Nov. 10-11, 2008	Omni Orlando Resort, Champions Gate, Orlando, FL	Multi-disciplinary Process Development (ASME Course CH757)	<a href="http://catalog.asme.org/Education/ShortCourse/MULTIDISCIPLINARY_PROCESS.cfm">http://catalog.asme.org/Education/ShortCourse/MULTIDISCIPLINARY_PROCESS.cfm</a>
Nov. 16, 2008	Philadelphia, PA AIChE Annual Meeting	Crystallization Process Development: From Lab to Plant	<a href="http://www.aiche.org/conferences/annual/shortcourses/S1.aspx">http://www.aiche.org/conferences/annual/shortcourses/S1.aspx</a>
Dec. 2008	Yokohama, Japan	Practical Strategies for Energy Issues of Chemical Plant Complexes	<a href="mailto:shortcourse@cwbttech.com">shortcourse@cwbttech.com</a>
Mar. 19-20, 2009	Las Vegas, NV	Multi-disciplinary Process Development (ASME Course CH757)	<a href="http://catalog.asme.org/Education/ShortCourse/MULTIDISCIPLINARY_PROCESS.cfm">http://catalog.asme.org/Education/ShortCourse/MULTIDISCIPLINARY_PROCESS.cfm</a>
Apr. 26, 2009	Tampa, FL	Practical Strategies for Energy Issues of Chemical Plant Complexes	<a href="mailto:shortcourse@cwbttech.com">shortcourse@cwbttech.com</a>

For detailed information on our upcoming training courses, contact us at [shortcourse@cwbttech.com](mailto:shortcourse@cwbttech.com), or Hideo Iketani of I.T. Solutions at [iketani@its-ykh.co.jp](mailto:iketani@its-ykh.co.jp)

Process Development

### A Strategy for Excellence in Process Development

Author: K. Kuan  
Editor: Frank G. Lewis/ASME Press, Inc.

Here is how to integrate overall process development activities and identify practices that facilitate commercial process development.

**Overview of the workflow**  
The book provides a systematic approach to the process development workflow. Authors discuss the specific requirements for the process development workflow, including the identification of the process, the selection of the process, the design of the process, the construction of the process, the operation of the process, and the maintenance of the process.

**Key features**  
• Provides a systematic approach to the process development workflow.  
• Discusses the specific requirements for the process development workflow.  
• Provides a comprehensive overview of the process development workflow.

### CLEAR WATER BAY TECHNOLOGY

4000 W. Valley Blvd., Suite 100  
Pomona, CA 91789, USA  
Phone: +1 (909) 595 8928  
Fax: +1 (909) 595 6899  
Email: [info@cwbttech.com](mailto:info@cwbttech.com)  
Web: [www.cwbttech.com](http://www.cwbttech.com)

Japan Contact:  
Hideo Iketani, I.T. Solutions  
Phone: +81 45 574 2312  
Fax: +81 45 575 2324  
Email: [iketani@its-ykh.co.jp](mailto:iketani@its-ykh.co.jp)