



### FEATURE REPORTS

#### Fuel flexibility and industrial combustion systems

**Summary:** The fuel supply for power generation and process heating is becoming increasingly diverse. It is important to utilize combustor designs that can operate on a range of fuels and maintain low emissions and stable performance. This article discusses many of the considerations in developing cleaner-burning combustion systems.

**Related equipment and services:** Industrial burners, combustion equipment, emissions control equipment; consulting services for combustion-related technology

### FOCUS

#### Packaging, transportation and storage

**Summary:** This section will consist of short descriptions of various commercially available technologies for packaging, storage and transportation of chemicals and raw materials.

**Related equipment and services:** Packaging line machinery, packaging materials, bulk material storage bins and containers, transportation safety equipment

### NEWSFRONT

#### Petroleum refining

**Summary:** This annual report will present the issues facing petroleum refiners today — from aging refineries and changing feedstocks, to environmental regulations and the latest technology being developed and commercialized to meet these regulations.

To submit editorial material for this news article, contact contributing editor Gerald Parkinson: gparkinson@che.com

**Related equipment and services:** Engineering and construction, process technology, environmental controls technology

#### Reactors

**Summary:** This news article will present some of the latest technology in reaction engineering and design. This may include improvements in the standard stirred tank reactor to process intensification and hybrid designs that combine reaction and separation in the same vessel.

To submit editorial material for this news article, contact contributing editor Joy LePree: jlepree@che.com

**Related equipment and services:** Stirred tank reactors, process intensification, hybrid reactors, membrane separation, automation and control systems, sensors and online analytical instrumentation

### FRACTIONATION COLUMN

**Summary:** This monthly column in CE is written by the technical director at Fractionation Research Inc., a consortium of end-users, engineering companies and distillation equipment providers that pool budgets on distillation research.

**Related equipment and services:** Distillation towers, trays and packings, tower scanning equipment and services

### ENGINEERING PRACTICE

#### Non-ideal gas calculations using residual properties

**Summary:** Many operations involving ideal gases are readily calculated using a basic knowledge of thermodynamics. Non-ideal gas behavior, however, can deviate significantly from that of ideal gases, and in some cases large errors can be introduced in process calculations if a gas is improperly assumed to behave ideally. The introduction of "Residual Functions" simplifies the calculation of thermodynamic function changes, such as the enthalpy or the entropy, when the conditions of a gas are changed. Tables or charts of dimensionless expressions of residual enthalpy and residual entropy are available in the literature but these are awkward to use in computational algorithms. Property algorithms are available in some chemical engineering software but these are not always available to the practicing engineer. Analytical expressions make it easier and more convenient to use residuals in process calculations.

Two equations of state commonly used by chemical engineers are presented: the Redlich-Kwong-Soave and the Peng-Robinson equations of state. These equations require only the knowledge of the critical properties of the gases, which are usually readily available, and can be carried out using handheld calculators. An example of an application to gas compression is given.

**Related equipment and services:** Software (mathematical calculations) and databases of thermodynamic properties



### Guidance for the selection and operation of gas turbines

**Summary:** Gas turbines are widely used in mechanical-drive and power-generation applications throughout the CPI. This article provides detailed recommendations to support gas turbine selection and arrangement, selection of auxiliaries, performance testing, proper operation and maintenance. It also discusses fuel-flexibility options associated with gas turbines (that is, the ability to use a wide array of liquid and gaseous fuels, including gasified coal, wood and biofuels).

**Related equipment and services:** Aeroderivative gas turbines, heavy industrial gas turbines, software systems for the design, simulation and operation of gas turbines, compressors, vibration monitors, filtration systems for both inlet and outlet streams, exhaust silencers, lubricants and lubrication systems

### Designing condensate drums for troublefree reboiler operation

**Summary:** Condensate pots are commonly used on the condensing sides of reboilers heated by latent heat (e.g., reboilers heated by steam or refrigerant vapor). They provide a liquid seal that prevents uncondensed vapor from blowing from the reboiler into the condensate system. When the reboiler seal is lost, vapor may channel through the reboiler, and heat transfer is lost. With steam reboilers, blowing vapor into the condensate header may also lead to hammering. This article highlights some key design considerations and dispels myths about placement of the condensate inlet to the drum. A case example is cited, wherein a temperature survey is analyzed.

**Related equipment and services:** Condensers and condenser drums, reboilers, distillation columns, temperature survey services

### FACTS AT YOUR FINGERTIPS

#### Pressure measurement

**Summary:** Knowledge of the various types of pressure is important in the selecting pressure sensors or gages. This one-page reference will describe different pressure types, as well as key considerations for the applications in which they are used.

**Related equipment and services:** Pressure sensors, pressure gages, pressure relief valves, rupture discs

### ENVIRONMENTAL MANAGER

#### Optimizing biological water treatment in oil refining

**Summary:** Wastewater from oil refineries can present large ranges of variation in contaminant loadings, making its treatment difficult to control. This article discusses the differences in controlling wastewater-treatment processes by mean-cell-retention time versus food-to-mass ratios, and further elaborates on how biokinetic modeling can be used to build a comprehensive model across normal and transient operating conditions.

**Related equipment and services:** Process modeling software and consultants; all equipment used for biological water treatment, such as bioreactors and aerators; analytical equipment and services used in wastewater processing, such as for COD (chemical oxygen demand), BOD (biological oxygen demand) etc.

#### LOOK FOR THESE ARTICLES COMING IN THE JUNE ISSUE:

##### Feature Reports

Flowmeters

Heat Exchanger Fouling

##### Equipment News Roundups

Distillation Trays & Packagings

##### Equipment Focuses

Seals & Gaskets

##### Facts at your Fingertips

Pumps

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