Heat treating companies today realize cost cutting is the key to continued success. Conserving utilities is the simplest, most practical way to reduce costs.

Bud Weiland
Energy Resource Control Corp.
Cleveland, Ohio

Today's metal producing manufacturers are faced with staggering utility costs. The tried and proved combination steam/furnace atmosphere system can greatly reduce your utility cost and also save on existing maintenance dollars. Committing to long-term, expensive liquid-nitrogen contracts or dealing maintenance problems associated with water-cooled exothermic/endothermic generators can be eliminated with the use of a specially designed S/G (steam/gas) generator that produces both the needed protective furnace atmosphere plus waste heat steam for a fraction of the cost. The goals of lower energy consumption, utility cost savings, and improved product quality can be obtained by installing a fuel-based nitrogen system (FBN).

How It Works
The FBN unit uses a simple process in which ambient air and natural gas are combusted in a controlled system to produce not only a furnace atmosphere but, simultaneously, steam or hot water for plant use. Depending on the metallurgical application, the flue gas is purified to fit various end results. Figure 1 shows a schematic representation of an ERC generating system.

Case Study
Small Tube Products, Duquesneville, Pa., is a North American producer of precision drawn, small-diameter, thin-wall copper alloy tubes used by more than 750 customers worldwide. The tubing is used by air conditioning and refrigeration manufacturers, appliance makers, utilities, and plumbing wholesalers, as well as heat exchanger manufacturers.

ERC Corp. reviewed the furnace atmosphere requirements with Dick Ott, Carl Squires, and Lenny Woleslagle of Small Tube. It was noted that the company was operating three continuous annealing furnaces, each having its own...
exothermic gas generator. Also operating at the plant was a 150-hp steam boiler used to provide steam for both the cleaning and pickle tanks. The three exothermic generators and steam boiler all required a large portion of the natural gas to operate their plant. The total exothermic atmosphere for the three annealing furnaces totals 35,000 scfh.

After a thorough study and review, Small Tube purchased a 40,000 scfh combination steam/exothermic system from Energy Resource Control Corp. Together with the steam/exothermic generator, the system also included a refrigerant dryer to produce a +40°F (+5°C) dew point and a combustible CO and H2 analyzer recorder.

By installing the combination steam/exothermic unit, the company was able to shut down the three water-cooled exothermic generators and the 150 hp natural gas-fired boiler. This saved thousands of dollars per month on their natural gas bills along with maintenance, electrical, water, and chemical costs associated with the exothermic generators and steam boiler.

After commissioning the ERC system, Small Tube stated the quality of the material from the furnace was also improved.

Still looking to maximize the value of the ERC combination unit, Lenny Woleslagle converted the natural-gas heaters used on the overhead loading dock doors to steam heaters using ad-

### Should You Consider a Fuel-Based Nitrogen Generator?

Evaluating some basic operating conditions/parameters of a particular application can provide an idea of whether an FBN generator may or may not be capable of reducing atmosphere costs. Items to consider include:

- **Atmospheric Requirements (composition, source, consumption in scfh, cost)**
- **Current Utility Costs**
  - Natural gas, $ per 1,000 ft³
  - Electric power, $ per kW h
  - Cooling water, $ per 1,000 gal
- **Plant Steam Requirements**

An example of how an FBN generator can save operating cost is shown below (data are from a recent ERC installation replacing two water-cooled rich exothermic generators and verified by the customer).

#### Utility costs

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Rate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>4,200 scfh</td>
<td>$8.50/1,000 ft³</td>
</tr>
<tr>
<td>Electricity</td>
<td>15 kW h</td>
<td>$0.08/kW</td>
</tr>
<tr>
<td>Cooling water</td>
<td>14,400 gph</td>
<td>$0.03/1,000 gal</td>
</tr>
</tbody>
</table>

**Maintenance:** estimated based on past records: $1,000/month

**Cost savings using FBN unit**

- Natural gas: $35.70/h × 720 h/month = $25,704/month
- Electricity: $1.20/h × 720 h/month = $864/month
- Cooling water: $0.29/h × 720 h/month = $209/month
- Maintenance: $1,000/month

**Monthly total = $27,777**

**Total annual savings (11.5 months) = $319,435**

The FBN unit completely shuts down the exothermic generator and uses the same costs to produce plant steam.
The high-purity atmosphere from a fuel-based nitrogen generator is suitable for use in many metal-processing applications. Additionally, the decarburizing agents (CO₂ and H₂O) normally present in conventional exothermic generators can be removed for more critical applications. The following are some of the advantages of installing the combination steam/nitrogen unit:

- 80% fuel savings based on replacing existing exothermic or endothermic generators
- 70% savings on cooling water
- 50% less floor space needed
- Substantial reduction in maintenance costs
- Environmentally friendly by reducing NOₓ and CO₂ emissions into the atmosphere
- 90% savings over using the N₂/H₂ system
- Return on investment is normally less than one year

ERC has installed many combination steam/exothermic and steam/nitrogen systems over the past 25 years. The metal producing companies currently using the unit include carbon steel-tube manufacturers, steel coil producers, motor lamination companies, aluminum producers, steel rod and bar suppliers, steel golf shaft manufacturers, copper and brass tubing, and sheet companies.

For more information: Bud Weiland is president, Energy Resource Control Corp., PO Box 517, North Olmsted, Ohio, 44070; tel: 440-734-2560 (work); 440-610-6239 (mobile); e-mail: bweiland@protectiveatmospheres.com; Web site: www.protectiveatmospheres.com