high efficiency
Condensing Economizers
Energy costs are the highest in recent history. Implementation of efficiencies in thermal processes is a vital element in streamlining rising energy costs.

Installation of condensing economizers can help companies improve overall heat recovery and steam system efficiency by up to 20% (in standard applications).

In the boiler room eLINE economizers transfer their waste heat to either the feed water or combustion air pre-heaters, essentially converting standard boilers into condensing boilers.

Covering a wide range of boiler sizes (from 500 MBTUH to up to 20 500 MBTUH), the eLINE delivers real energy and cost savings for commercial and industrial installations.

eLINE economizers from SEC are an integral part of any efficiency improvement program. The total range includes 7 economizer models.

eLINE features and benefits:
- increased system efficiency
- real energy and cost savings
- converts standard boilers into condensing boilers
- increases existing boiler efficiency by up to 20%
- feasible for boiler systems ranging from 500 MBTUH to 20 500 MBTUH
- unique tube design for optimal thermal performance
- easy installation, low maintenance

Typical economizer applications include:
- district heating systems
- greenhouses
- food processing plants
- pulp and paper mills
- textile plants
- dairy processing facilities
- hospitals
- hotels

MONEY SAVINGS WITH eLINE ECONOMIZERS !!!
Approximate energy savings achieved with E20.1 economizer model:

<table>
<thead>
<tr>
<th>INPUT DATA</th>
<th></th>
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<tbody>
<tr>
<td>HOT WATER INLET TEMPERATURE</td>
<td>86°F</td>
<td>86°F</td>
</tr>
<tr>
<td>FLUE GAS TEMPERATURE</td>
<td>428°F</td>
<td>428°F</td>
</tr>
<tr>
<td>BOILER INPUT</td>
<td>4 952 MBTUH</td>
<td>4 952 MBTUH</td>
</tr>
<tr>
<td></td>
<td>(85 SCFM /148 m³/h – natural gas flow)</td>
<td>(85 SCFM /148 m³/h – natural gas flow)</td>
</tr>
<tr>
<td>BOILER OPERATING TIME</td>
<td>8 400 h/yr</td>
<td>8 400 h/yr</td>
</tr>
<tr>
<td></td>
<td>(full load operation)</td>
<td>(full load operation)</td>
</tr>
<tr>
<td>ENERGY SAVING</td>
<td>15.7%</td>
<td>15.7%</td>
</tr>
<tr>
<td></td>
<td>(ref. chart 1 – see opposite)</td>
<td>(ref. chart 1 – see opposite)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>PAYBACK SUMMARY</th>
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<tbody>
<tr>
<td>ANNUAL NATURAL GAS SAVINGS</td>
<td>191 226 m³</td>
<td>191 226 m³</td>
</tr>
<tr>
<td>ANNUAL CO₂ REDUCTION</td>
<td>843 161 lb</td>
<td>843 161 lb</td>
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<tr>
<td>ANNUAL COST SAVINGS</td>
<td>149 156 USD*</td>
<td>149 156 USD*</td>
</tr>
</tbody>
</table>

*(natural gas avg price = 0.78 USD /m³)
**eLINE PERFORMANCE CHART**

**Entry data:**
Nominal boiler input: 4952 MBTUH  
Nominal boiler efficiency: 80%  
Water inlet temperature: 86°F  
Flue gas temperature: 428°F

**STEP 1**
Determine your boiler capacity on the horizontal axis labeled “kW” – for sample purposes we have chosen 4952 MBTUH boiler, ref point 1.

**STEP 2**
Find points where the red line crosses with water inlet temperature indications (arched colored lines). Assuming water inlet temperature is 86°F, intersections points are marked 2 and 4. Corresponding horizontal lines and points marked 3 and 5 indicate overall boiler efficiency to be 95.7% and 94.5% respectively.  
Associated energy savings are as follows:
- 15.7% for E20.1 model (95.7% - 80% = 15.7%) and  
- 14.5% for E16.1 model (94.5% - 80% = 14.5%)

**STEP 3**
Intersection points 6 and 8 and corresponding horizontal lines pointing to 7 and 9 show pressure drop values for the given boiler capacity.
- For E20.1 model – pressure drop of 0.15 in H₂O  
- For E16.1 model – pressure drop of 0.22 in H₂O

**Conclusion:**
The sample case above shows 2 economizer models E16.1 and E20.1 as possible solutions. The E20.1 model has a higher efficiency and lower pressure drop compared to E16.1, therefore is an overall better choice.

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**Boiler efficiency: 80% (before installing economizer)**  
**Flue gas temp.: 428°F**  
**Fuel: Methane CH₄ - λ**

[Chart 1]
The economizer’s simple technology and lack of moving parts gives it a very long and relatively maintenance-free life cycle. Simple paybacks for condensing economizers are often less than 2 years.

The unique design of the heat exchanger tubes, the so-called “tear-drop” shape, guarantees maximum heat transfer surface contact with the flue gas, while decreasing the creation of flow wakes. The tubes are strategically positioned in a matrix to optimize the thermodynamic process, by inducing gas turbulence and increasing the heat transfer rate, and minimizing overall gas pressure drops through the system.

The stainless steel durable construction is designed to withstand the corrosive effects of condensing flue gases, and is insulated to minimize heat losses.

**ECONOMIZER CONSTRUCTION MATERIAL:**
- stainless steel 316L or 304L
  - for economizers working with gas-fired boilers
- stainless steel 904L
  - for economizers working with heavy-oil fired boilers (optional)

**WORKING PRESSURE** 160 PSI
**DIAGRAM 1**
eLINE economizer and boiler connected in series.

**DIAGRAM 2**
eLINE economizer and boiler connected in series with additional hydraulic clutch.

**DIAGRAM 3**
eLINE economizer and boiler with two additional hydraulic clutches and three-way valve.

**DIAGRAM 4**
eLINE economizer and boiler with three additional hydraulic clutches and three-way valve.

**DIAGRAM 5**
eLINE economizer and two boilers with hydraulic clutch.
Technical Product Specifications

Connection dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal Boiler Input</th>
<th>Exhaust Inlet</th>
<th>Exhaust Outlet</th>
<th>Water Inlet</th>
<th>Water Outlet</th>
<th>Drain Nozzle</th>
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<tr>
<td></td>
<td>kW</td>
<td>&quot;MBTU/hr&quot;</td>
<td>&quot;mm&quot;</td>
<td>&quot;mm&quot;</td>
<td>&quot;mm&quot;</td>
<td>&quot;mm&quot;</td>
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<tr>
<td>E 8.1</td>
<td>150 - 250</td>
<td>500 - 850</td>
<td>200</td>
<td>8</td>
<td>8</td>
<td>DN65 2-1/2</td>
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<tr>
<td>E 12.1</td>
<td>200 - 500</td>
<td>550 - 1700</td>
<td>300</td>
<td>12</td>
<td>12</td>
<td>DN65 2-1/2</td>
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<tr>
<td>E 15.1</td>
<td>450 - 1200</td>
<td>1,500 - 4,100</td>
<td>400</td>
<td>16</td>
<td>400</td>
<td>DN200 4</td>
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<tr>
<td>E 16.1</td>
<td>1,100 - 1,500</td>
<td>2,750 - 1,500</td>
<td>500</td>
<td>20</td>
<td>500</td>
<td>DN150 6</td>
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<td>2,000 - 4,000</td>
<td>3,800 - 6,500</td>
<td>500</td>
<td>20</td>
<td>500</td>
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<tr>
<td>E 28.1</td>
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<td>28</td>
<td>700</td>
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<td>E 35.1</td>
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<td>13,650 - 20,475</td>
<td>900</td>
<td>35</td>
<td>700</td>
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Dimensions

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<tr>
<th>Model</th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
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<tr>
<td></td>
<td>mm</td>
<td>in</td>
<td>mm</td>
<td>in</td>
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<td>in</td>
<td>mm</td>
<td>in</td>
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<td>72.07</td>
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<tr>
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<td>85.44</td>
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<td>66.54</td>
<td>681</td>
<td>26.81</td>
<td>681</td>
<td>26.81</td>
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SEC is a designer and manufacturer of heat exchangers and heat transfer systems. Over the years, our creativity and engineering expertise have resulted in a comprehensive line of products utilizing advanced thermal processes and technologies.

We are certified by renowned international inspection authorities. Our quality process and management systems fulfill the requirements of ISO 9001 Quality Management System. SEC heat exchangers are designed, tested and manufactured in accordance with ASME (Section IV and VIII) and PED [97/23/UE] regulations.

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