Condensate Recovery
Condensate recovery

- Why condensate should be recovered?
- What makes an efficient return system?
- Condensate pumps and diagnostics?
Why return condensate?

- Saves water
- Saves fuel
- Saves Boiler Chemicals
- Reduces Oxygen
- Reduces Corrosion and wear
- Increases Boiler Feedtank water temperature
- SAVES MONEY!
### Efficiency

<table>
<thead>
<tr>
<th>Pressure (bar)</th>
<th>cond. lost flash lost</th>
<th>cond. Returned flash lost</th>
<th>con. returned flash recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>72.5</td>
<td>86.5</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>75.0</td>
<td>89.1</td>
<td>100</td>
</tr>
<tr>
<td>3.5</td>
<td>78.3</td>
<td>92.4</td>
<td>100</td>
</tr>
<tr>
<td>0</td>
<td>85.6</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

( Assumed: water at 7 deg C and flash used at 0 bar )
Typical Steam Circuit

- Boiler
- Make-up Water
- Feed Pump
- Condensate
- Feed Tank
- Process Vessel
- Pan
- Vat
- Steam
- Heating System
Cost effective condensate return

**Fuel Saving:**

- **Condensate recovered** = 1,000 kg/h
- **Hours per year** (10 x 5 x 48) = 2,400 h
- **Total condensate recovered** = 1,000 x 2,400 = 2,400,000 kg

Assume condensate 85 deg C, cold make up 15 deg C,

- **Heat saved** = 2,400,000 x 4.186 x (85 - 15) kJ/year
- **Calorific value of diesel** = 44,000 kJ/Kg
- **Boiler efficiency**, say 80%

- **Fuel saved** = \( \frac{2,400,000 \times 4.186 \times 70 \times 100}{44,000 \times 80} \) = 19,978 Kg = 23,505 L

**Fuel cost** (Assuming the Price of 1 L of diesel=0.68 JD)

- **Annual saving in fuel** = 15,983 JD/Year
Cost effective condensate return

**Water**

Water cost = 1.3 JD / m³

Water saved = 2,400,000 kg = 2400 m³

Annual cost saving = 2400 x 1.3 JD = 3,120 JD

Total savings (for 1000 l/h) = 15,983 + 3120 = 5455 JD

PLUS cost of treatment and increased boiler blowdown !!
Traps Operating at Different Pressures

10 bar g

Variable 0-10 bar

3 bar g

Receiver
Traps Operating at Different Pressures

- 10 bar g
- Variable 0-10 bar g
- 3 bar g

Receiver 0 bar g
What does a condensate pipe carry?

- 10 bar g
- 100 kg/h
- 0 bar g
What does a condensate pipe carry?

16 % flash

Mass
Condensate 84 kg/h
Flash Steam 16 kg/h

Volume
Condensate 0.084 m³/h
Flash Steam 26.76 m³/h
Quantity of Flash Steam in Line

Condensate
- 100 kg/h
- 10 bar

16 kg Flash Steam
- 99.68% of Total Volume

84 kg Condensate
- 0.32% of Total Volume
Flash Steam Recovery

- Inlet
- Condensate Outlet
- Flash Steam Outlet
Flash Steam Application