Neutralizer

- Akline
  - 14
  - 12
  - 10
  - 8
  - 6
  - 4
  - 2
  - 0

- Ammonia
- Seawater (海水)
- Tap water
- Distilled water
- Unpolluted rain water
- Condensate of gas boiler
- Condensate of oil boiler
- Battery acid / stomach acid

- pH

- Neutralizer
- Activated carbon

- Before (pH=1.7 ∼ 2.5)
- Before (pH=7.0 ∼ 7.5)
Table 1. Neutralizer Component Analysis

<table>
<thead>
<tr>
<th>Categorization</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC Neutralization (%)</td>
<td></td>
</tr>
<tr>
<td>SiO₂</td>
<td>55.1</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>3.78</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>1.00</td>
</tr>
<tr>
<td>*CaO</td>
<td>29.4</td>
</tr>
<tr>
<td>*MgO</td>
<td>1.56</td>
</tr>
<tr>
<td>Heat &amp; Weight reduction</td>
<td>8.55</td>
</tr>
</tbody>
</table>

Table 2. pH changes of remained condensate in Neutralization

<table>
<thead>
<tr>
<th>Neutralization</th>
<th>1ℓ</th>
<th>0.5ℓ</th>
<th>0.25ℓ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensate pH (expired life span)</td>
<td>4.1(T1)</td>
<td>3.38(T2)</td>
<td>2.92(T3)</td>
</tr>
<tr>
<td>Condensate pH (after 40hrs)</td>
<td>7.38(T1′)</td>
<td>7.42(T2′)</td>
<td>7.42(T3′)</td>
</tr>
</tbody>
</table>

**Conclusion**

1. Neutralization the acid condensate is by increasing alkaline M-alkalinity (HCO₃⁻, CO₃²⁻, OH⁻) in the condensate, but not because of deoxidation of acidic ion (SO₄²⁻, NO₃⁻ etc.) in the condensate.
2. Factors affecting life expectancy of Neutralization are as follows:
   - alkaline materials content level
   - acidity of condensate (the life expectancy is differ depending on acidity up to 47%)
   - condition of boiler operation (continuous or discontinuous operation, up to 48%)
   - response time (neutralization device design)
   - evaporation loss of condensate (condition of boiler operation)
3. 1ℓ of ALC neutralization at part-load of boiler able to neutralize approx. 25ℓ(pH=5 or more) of condensate.
4. The life expectancy of Neutralizer is considered as 37-50ℓ of condensate, according to the laboratory test result (when the acidity of condensate is pH 1.8 – 3.2)