



## HEI DEAERATOR TROUBLESHOOTING GUIDE

This troubleshooting guide is an excerpt from the 7<sup>th</sup> edition of the *Standards for Typical Specifications for Tray Type Deaerators* and has been prepared to assist operators of deaerators. The guide provides general guidance, and operators are advised to consult with the manufacturer when necessary for specific instructions regarding their equipment. Many of the items listed below are not in the scope of the deaerator manufacturer; however, these items do affect operation and must be considered by operators.

The troubleshooting guide refers to sections in the 7<sup>th</sup> edition of the *Standards for Typical Specifications for Tray Type Deaerators* for additional information. The standard is available through the HEI office and can be ordered by contacting the HEI at [hei@heatexchange.org](mailto:hei@heatexchange.org) or 216-241-7333.

Symptom	Possible Causes	Comments or Possible Solutions
<b>High O<sub>2</sub></b>	<ul style="list-style-type: none"> <li>-Air in-leakage</li> <li>-Insufficient stabilization period*</li> <li>-Trays not installed properly and in place</li> <li>-Not steady state conditions*</li> <li>-O<sub>2</sub> inlet not in accordance with specified design conditions</li> <li>-Spray valves not installed correctly</li> <li>-Water inlet temperature too low</li> <li>-Improper venting</li> <li>-Incorrect testing</li> </ul>	<ul style="list-style-type: none"> <li>-See test procedures in section 7.4</li> <li>-Loose fittings</li> <li>-Shut scavenger off</li> <li>-Remove chemical interferences</li> </ul>
	<ul style="list-style-type: none"> <li>-Operation outside of design conditions</li> </ul>	<ul style="list-style-type: none"> <li>-Verify design conditions</li> </ul>

\*Often, high oxygen measurements can be traced to inadequate test procedures. In order to conduct a proper test, it is important that there be a sufficient stabilization period and steady state conditions. The proper length of a stabilization period is extremely dependent on system-specific conditions, particularly the size of the system. Therefore, while three days of boiler operation are typically required to reach steady state, no definitive guidelines can be given. As a general rule, if there is a downward trend in oxygen content measurements, steady state condition has not yet been attained.

\*\*Shading is provided for the ease of reading only.

Symptom	Possible Causes	Comments or Possible Solutions
<b>Excessive Pressure Fluctuation</b>	<ul style="list-style-type: none"> <li>-Steam PRV improperly sized or calibrated</li> <li>-Improperly sized downcomer and equalizer</li> <li>-Inlet steam pressure too high or too low</li> <li>-Improper pilot installation</li> <li>-Excessive inlet temperature variation</li> <li>-Heater flooding</li> </ul>	<ul style="list-style-type: none"> <li>-Check size and calibration</li> <li>-Keep within design range</li> <li>-Check all valve and control settings</li> </ul>
<b>Low Outlet Temperature</b>	<ul style="list-style-type: none"> <li>-Incorrect thermometer reading</li> <li>-Insufficient steam flow</li> <li>-Incorrect steam/water ratio</li> <li>-Spray valves or internals malfunctioning</li> <li>-Heater flooding</li> <li>-Inlet flows piped incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>-Check calibration</li> <li>-Check steam supply</li> <li>-Check for restrictions</li> <li>-Check pipe and valve sizing</li> <li>-Check heat and mass balances</li> <li>-Check spray valves, trays, etc.</li> <li>-Check all valve and control settings</li> <li>-Check all inlet flows and temperatures</li> </ul>
<b>Water Hammer</b>	<ul style="list-style-type: none"> <li>-Inlet flows mixing just prior to deaerator inlet</li> <li>-Improper pipe design</li> <li>-High inlet velocities</li> </ul>	<ul style="list-style-type: none"> <li>-Mix flows farther upstream of deaerator</li> <li>-Check and/or redesign</li> <li>-Keep within HEI</li> </ul>
<b>High CO<sub>2</sub></b>	<ul style="list-style-type: none"> <li>-High CO<sub>2</sub> at inlet</li> <li>-High pH</li> <li>-Improper venting</li> </ul>	<ul style="list-style-type: none"> <li>-Verify CO<sub>2</sub> design condition</li> <li>-Lower pH</li> <li>-Review vent system</li> </ul>
<b>Tray Upsets</b>	<ul style="list-style-type: none"> <li>-Tray hold down not secure</li> <li>-Turbine trip</li> <li>-Flashing</li> </ul>	<ul style="list-style-type: none"> <li>-Install correctly</li> <li>-Gradual increase/decrease of controlled flows</li> </ul>
<b>Unexpected Storage Tank Level Excursions</b>	<ul style="list-style-type: none"> <li>-Malfunctioning level control system</li> <li>-Malfunctioning overflow or improper boiler feed pump operation</li> <li>-Pressure fluctuations</li> </ul>	<ul style="list-style-type: none"> <li>-Check setting and system operation</li> <li>-Check overflow level and boiler feed pump operation</li> <li>-Refer to “Excessive Pressure Fluctuation”</li> </ul>
<b>Water Out of Vent</b>	<ul style="list-style-type: none"> <li>-Cracked vent welds</li> <li>-Improper vent piping</li> <li>-Water carryover</li> </ul>	<ul style="list-style-type: none"> <li>-Repair or redesign</li> <li>-Should be as short and as vertical as possible</li> <li>-Reset vent flow</li> </ul>
<b>Iron Oxide in Deaerator</b>	<ul style="list-style-type: none"> <li>-Condensate or system corrosion</li> <li>-Frequent shutdowns</li> <li>-High O<sub>2</sub></li> </ul>	<ul style="list-style-type: none"> <li>-Keep positive pressure on deaerator</li> <li>-See “High O<sub>2</sub>”</li> </ul>

\*\*Shading is provided for the ease of reading only.