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U.S. Deaerator Company. For all your deaerator, boiler feed, condensate, and water heating equipment needs.

COMMON DEAERATOR PROBLEMS AND THEIR SOLUTIONS

DEAERATOR PROBLEM:
Deaerated water oxygen content is higher than normal.

1. Check to make sure that the deaerator vent is clear and at least an 18" plume of steam is venting freely to atmosphere. This is likely the most common source of deaerator issues. If the oxygen is not being released to atmosphere via the vented steam carrier, then the stored water temperature will drop which can be a clear indication of this problem. If the deaerator is venting properly but the problem remains, slightly increase the vent rate by adjusting the vent valve to create a longer steam plume. Continue this process until the stored water temperature returns to something close to steam saturation temperature. Recheck the oxygen content to verify your adjustments.

2. Verify that full operating steam pressure is available and flowing into the deaerator under all conditions. Without a positive steam pressure, the deaeration process simply will not happen. Once again, the stored water temperature will drop below normal with this issue. In some applications, steam supply can be marginal and steam pressure can drop to zero under periods of heavy deaerator load. Without positive steam pressure in the deaerator, it can actually create a slight vacuum and draw oxygen back into the deaerator and contaminate your deaerated water quality. This why a minimum of 5 PSIG is recommended as a deaerator operating pressure in order to maintain a buffer to deal with surges, 10 PSIG is even better to provide more of a positive cushion in such cases.

3. If the above corrections do not solve the problem, then the issue is likely internal and the deaerator will need to be opened and carefully examined to determine the source cause. It may be that the trays were not installed properly or perhaps not at all. Without proper tray installation, optimum deaerator performance cannot be achieved. There could be an issue with the spray pipe or spray valves being installed incorrectly or being stuck in an open position. There could also be a problem with the traybox itself as a result of cracking or breakage allowing oxygen to escape into the deaerator vessel causing it to bypass the normal function of being vented safely to atmosphere. Issues of this nature will require repair or replacement of the internal components.

4. In most applications, a chemical sulfite additive is pumped into the deaerator storage tank in order to "polish" the deaerated water down to a zero oxygen content. If this is your normal condition for operation, a disruption of the sulfite injection will, of course, affect the deaerated water oxygen content negatively causing a concern about deaerator water quality. In these cases, you should consult with your chemical provider to be certain that sulfite dosage is correct and that the chemical feed equipment is working properly.

DEAERATOR PROBLEM:
Water hammer noises from the deaerator.

1. Noises of rumbling and violent water hammer can originate in various places that are normally not within the deaerator itself. Upstream conditions of steam piping, makeup water piping, condensate return piping, heat recovery equipment and even the boiler itself could be creating these potentially dangerous conditions externally from the deaerator. Steam piping that is not trapped properly to release condensate as it forms within the piping itself can create water hammer as slugs of condensate hit elbows or the deaerator inlet at steam velocity. Cool makeup water and hot condensate coming together in a confined piping area can sometimes create violent reactions between the cold and hot water flow streams depending on the temperature differential. Improperly piped heat recovery equipment can also create these conditions. The boiler itself could be carrying over water from the steam release area and convey slugs of boiler water down the steam piping directly to the deaerator which is the single largest steam consumer in most systems. Boiler feed recirculation can also be a potential cause if not introduced to the deaerator in the proper area or if it comes back to the deaerator with an excessive flow rate.

DEAERATOR PROBLEM:
Deterioration of upper traybox, spraypipe or trays.

1. Oxygen corrosion/heat exposure over the very long term can eventually cause the trays to deteriorate to a point of needing replacement. This is considered normal wear and tear on the deaerator which must be maintained like any other mechanical device. However, short term destruction of the upper traybox area, spraypipe or trays usually indicates a phenomenon known as “Chloride Stress Corrosion Cracking”. This occurs when the chloride content of the makeup water is high (normally in excess of 100 PPM) and varies greatly depending on condensate return percentage. Maximum condensate returns will always help to minimize this problem.

The chlorides actually attack the grain structure of the stainless steel in the elevated temperature conditions within the deaerator causing it to severely break down to a point where the metal becomes very brittle and weak. At the point of failure, the components will eventually crack and break away creating leaks within the deaerator. Remarkably, the stainless steel has weakened to the extent that you can easily break off small pieces with your bare fingers, much like breaking a soda cracker in half.

If this condition is confirmed to exist, there are three ways to solve the problem. One is by reducing the chloride content of the makeup water if possible. The next is by using a superior grade of stainless steel that is resistant to the chloride attack. US Deaerator uses Duplex 2205 grade stainless steel in these instances for its superior oxygen corrosion and chloride resistance. The third is by bringing more condensate back to the deaerator thereby diluting and reducing the chloride concentration that ultimately flows through the deaerator. This option can yield huge results in cost savings as well by reclaiming otherwise lost water, heat content and chemical treatment.

DEAERATOR PROBLEM:
Water level control difficulties.

1. Water level irregularity within the deaerator storage tank can come from different sources. If the deaerator water inlet control valve is undersized, it may not admit enough water to allow for heavy demand periods creating a temporary and misunderstood drop in water level. A malfunctioning overflow trap or overflow control valve could create a small or very large loss of water and the resulting unexplained drop in water level. The standard level control components can and will need attention over time and should be checked carefully to see that they are performing properly. Large slugs of condensate return coming back to the deaerator uncontrolled, like a startup load condition for

example, can create a sudden but temporary rise in water level. If the steam operating pressure of the deaerator is too high, that could create a condition where the makeup water or condensate simply cannot get into the deaerator causing a drop in water level due to the pressure limits of those water supply sources.

In all of the above cases, careful and systematic analysis of these system components will normally reveal a cause for the changes in water level. Once corrected, normal steady deaerator water levels should be maintained within the storage tank.

DEAERATOR PROBLEM:
Steam pressure control difficulties.

1. Steam pressure control problems in the deaerator normally come from one source which is the steam pressure control components themselves. They will need to be checked to verify normal operation and adequate sizing for your deaerator operating conditions. If undersized, they can create a drop in steam pressure under heavy deaerator loads. Heavy makeup and even heavy condensate return loads can cause steam pressure to drop if the controls are not sized properly. Steam safety valves also need to be checked to see if they are relieving unnecessarily or lifting prematurely and repaired at an ASME code shop if found to be defective.

DEAERATOR PROBLEM:
Water droplets coming from the vent pipe.

1. The deaerator spraypipe may be installed incorrectly and must be properly realigned to spray in the right direction. The vent pipe extension to atmosphere could be too long and contain too many elbows creating an arduous path for the venting steam. This can create pockets of pooled condensate that burp out of the vent pipe on a regular basis. The vent pipe must be short and direct to the very end with no low pockets for condensate to potentially form. The end of the vent should be in a place that can be easily seen so the deaerator vent rate can be regularly monitored for proper flow and to verify that the release is steam vapor only.

DEAERATOR PROBLEM:
Iron oxide buildup in the deaerator.

1. Heavy iron oxide or rust deposits should not be present inside the deaerator when the system is normally up and running at design conditions the majority of the time. Heavy buildup is usually a result of contaminated condensate return which can carry the rust deposits into the deaerator after being created somewhere out in the steam/condensate system. It can also happen in a deaerator that is only used periodically like winter uptime/summer downtime applications. Aside from these possibilities, the deaerator internals should be relatively free of red iron oxide or rusty deposits. If this condition persists, a thorough review should be made of your deaerated water quality to determine if the deaerator is performing as expected. Effluent water should contain 7-10 PPB dissolved oxygen when testing a flowing sample stream under normal operating conditions. Test results can vary from one test kit to another and from one tester to another.