Selective silica carryover

- Carryover of solids to turbine can be due to poor water chemistry, suspended solids in boiler water, excessive chemical dosing, highly alkaline boiler water, improper drum internal design, improper drum internal fit up, high drum level operation.

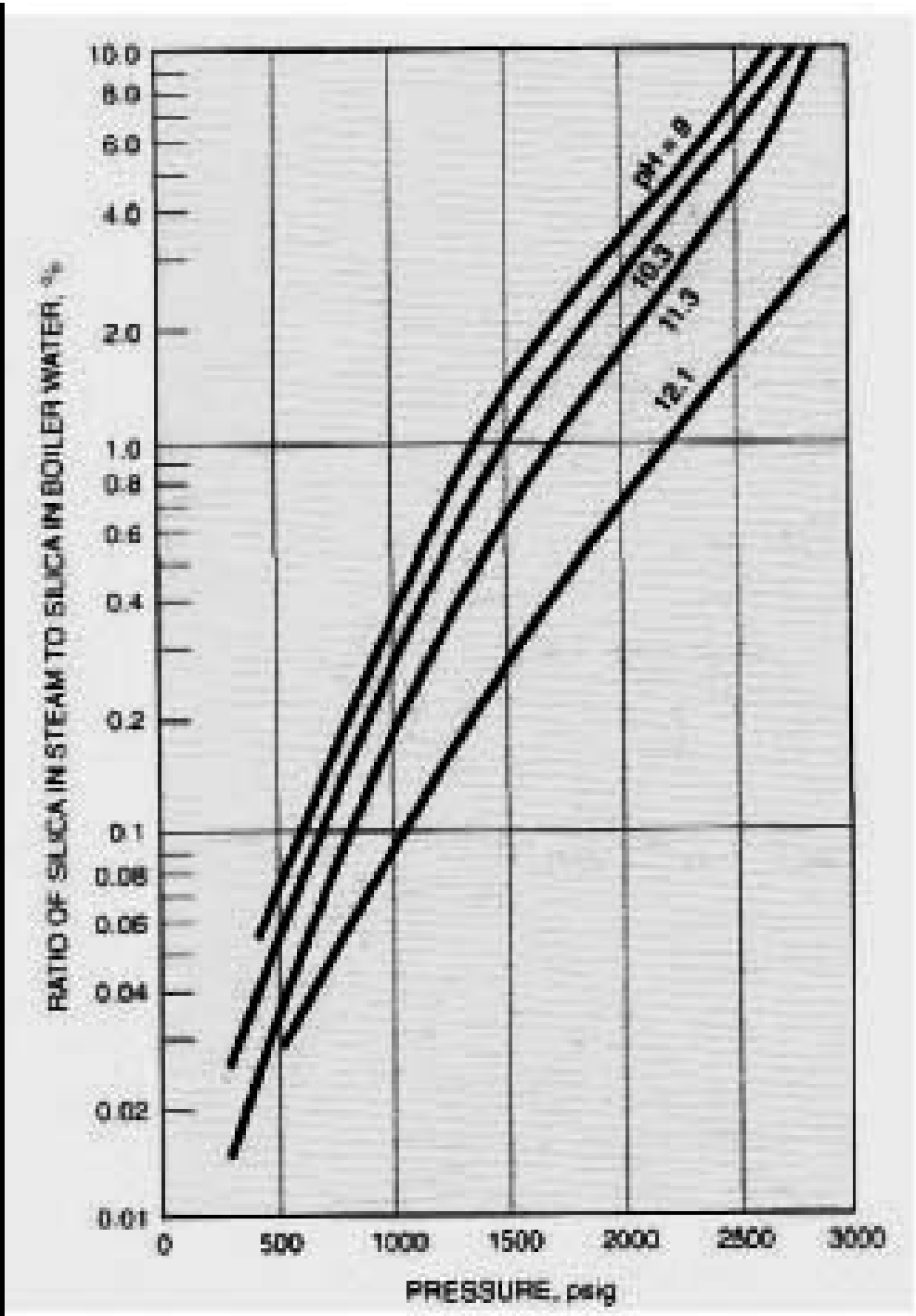
- Silica deposits can occur even if the mechanical carryover is completely taken care of.
- Steam selectively picks up silica from boiler water, dissolves in steam, carries over to turbine, deposits on condensation.

- At higher boiler operating pressures silica carryover is not controlled by drum internals.
- The carryover of silica is a function of operating pressure & Boiler water pH.

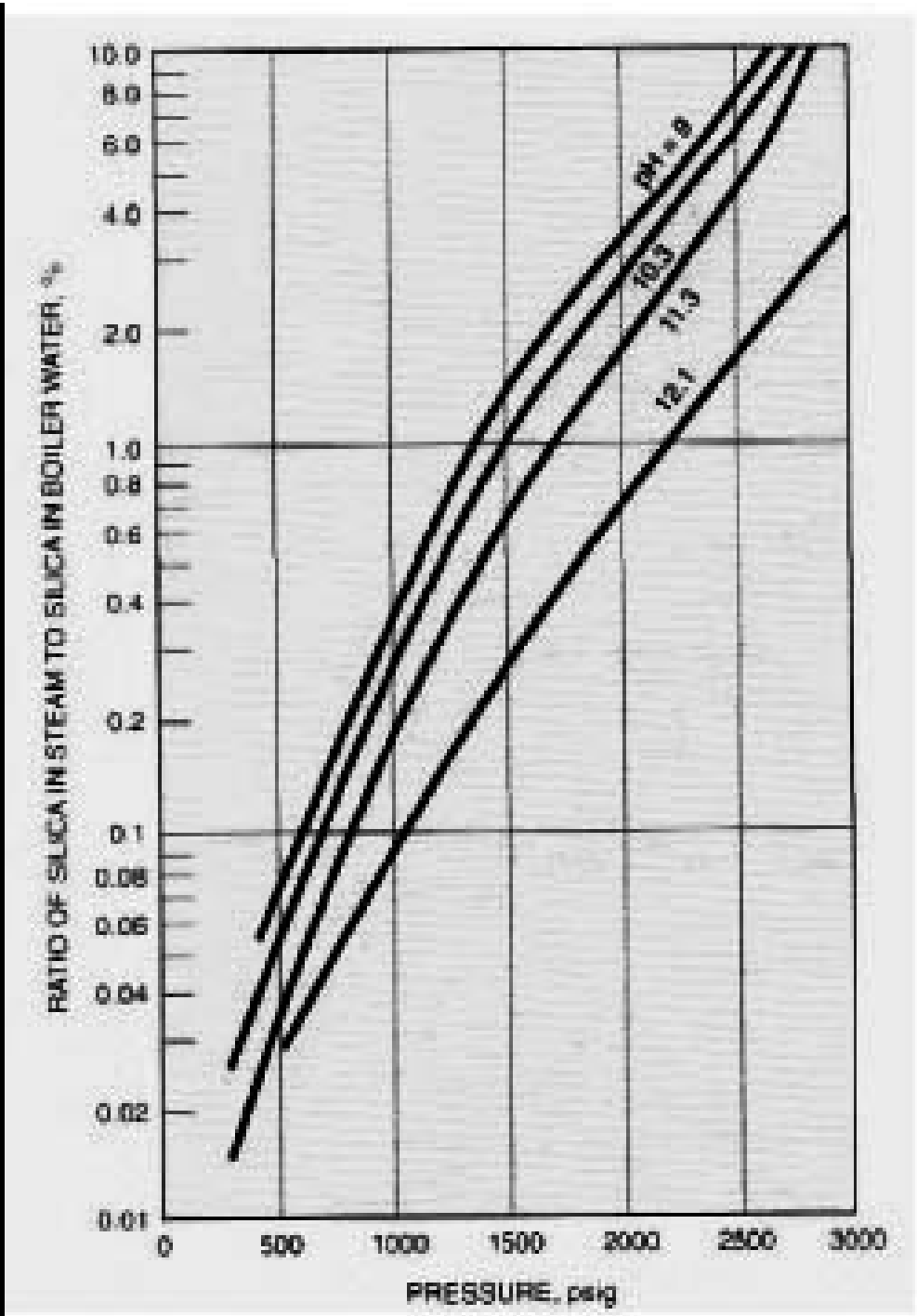
Why silica in steam should be < 0.02 ppm

- It has been seen in years that silica of 0.02 ppm is the practical maximum limit for boiler water with pH >10.
- With silica < 0.02 ppm, appreciable turbine deposits are not seen.
- Silica scales are typically very hard, glassy adherent, and difficult to remove.

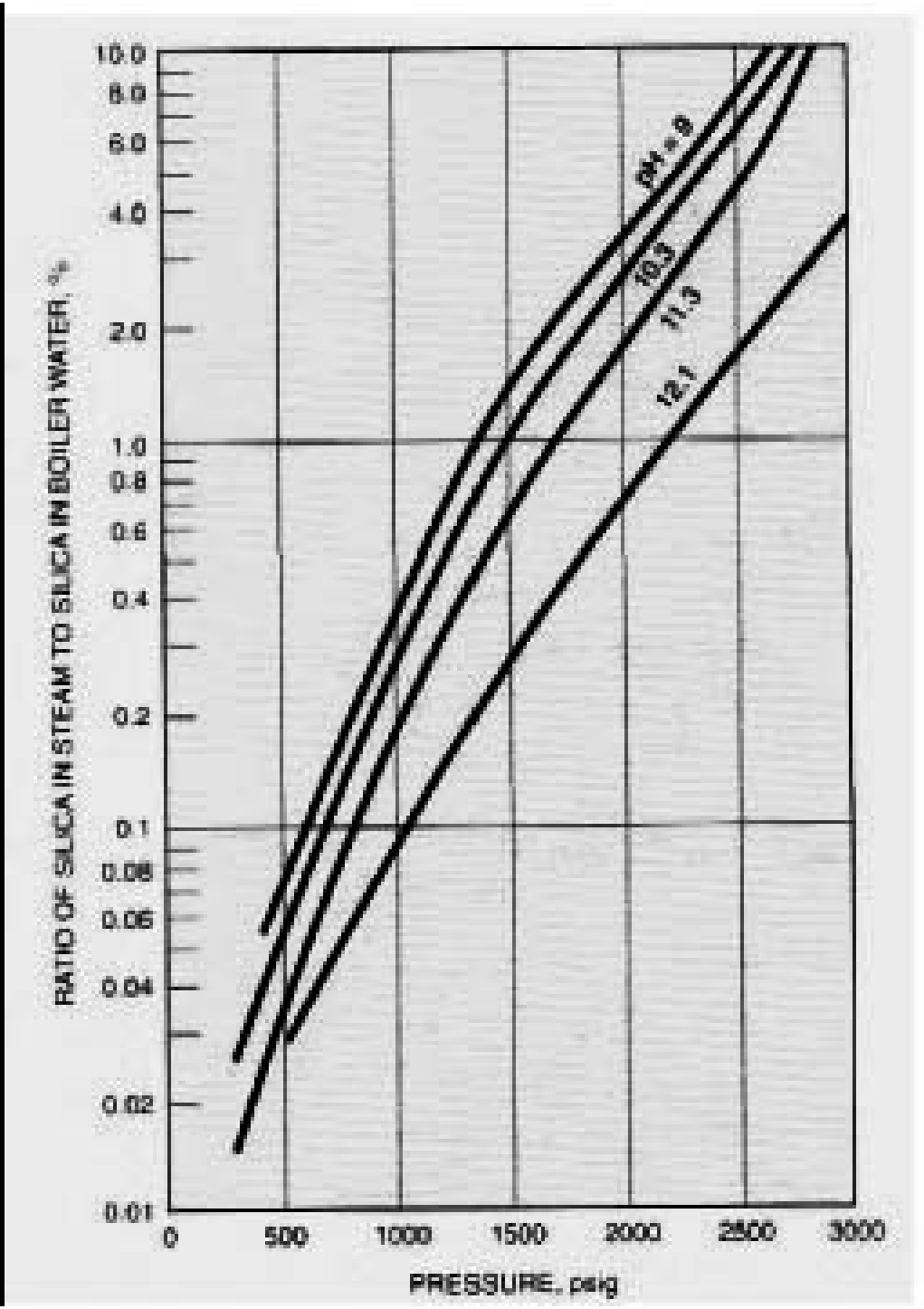
The conditions under which vapour silica carryover occurs have been investigated and documented.
For any given set of boiler conditions using demineralized or evaporated quality make up water, silica is distributed between the boiler water and the stream in a definite ratio.



This ratio depends on water pressure and boiler water pH. The values of the ratio increases with increasing pressure and decreases with increasing pH. The effect of the pH becomes greater as higher pH values (from 11.3 to 12.1).



Maximum boiler water silica allowable to maintain less than 0.02 ppm silica in the steam



- The blow down is set to maintain the allowable silica concentrations in the boiler water.
- Blow down can be minimized if only make up water silica is treated /condensate contamination is controlled.
- After silica enters the boiler water, the usual corrective action is to increase boiler blow down and then to correct the condition that caused the silica contamination.

Some more facts on silica solubility

- Silica is more soluble in superheated steam than in saturated steam.
- Silica remains more in water for increased boiler water alkalinity. But alkalinity limits are not to be exceeded to control boiler corrosion.

- ✓ When a turbine becomes fouled with water soluble salts of boiler water carryover or attemperating water contamination, turbine capacity can often be restored by water washing.
- ✓ But when the turbine is fouled with compounds that are not water soluble (including silica), water washing rarely restores capacity.
- ✓ Out-of-service cleaning by blasting with aluminium oxide or other soft grit material is required to remove these deposits.