# Corrosion Free Piping for Chemicals in a Power Plant

Power plants require a variety of chemicals in order to maintain the process of energy generation. The most sensitive application areas are cooling and boiler water treatment, since a failure here impacts directly the continuity of the energy generation process, often by chemical corrosion. Typical power plants handle amounts from ca. 50 to to ca. 6000 tons of different chemicals per year.

**Table 1**: Basic Chemicals and material guidelines for use in Power Plants

| Representative basic chemicals for power plants | | | | |
|---|---|---|---|---|
| Basic Chemicals | Chemistry | Delivered Concentration | Application area | Recommended piping materials |
| Caustic soda, Lye | NaOH | Pills, 20 - 50 % | Neutralisation, pH-adjustment, Regeneration of ion exchangers | PE, PP, PVC-U |
| Sulfuric acid | $H_2SO_4$ | 37 - 96 % | De-carbonisation, pH-adjustment | PE, PP, PVC-U, PVC-C, PVDF, depending upon concentration |
| Hydrochloric acid | HCl | 30 -32 % | De-carbonisation, pH-adjustment | PE, PVC-U, PVC-C, PVDF, |
| Ferric chloride | $FeCl_3$ | 40% | Flocculating agent, wastewater treatment | No restrictions for GF thermoplastics |
| Citric acid, monohydrate | $C_6H_8O_7$ | solid | Cleaning agent | No restrictions for GF thermoplastics |
| Formic acid | HCOOH | 25 - 85 % | Cleaning agent | PE, PP, PVC-U and PVDF |
| Hydrazine / -hydrate | $H_2N\text{-}NH_2$ / $H_2O$ | 24% | Oxygen scavenger in boiler water treatment | PE, PP, PVC-U |
| Sodium sulfide, -hydrogen sulfide | $Na_2S$ / NaHS | ca. 20 % | Heavy metal precipitation | No restrictions for GF thermoplastics |
| Hydrogen peroxide | $H_2O_2$ | 35% | Wastewater treatment | Only PVC-U and PVC-C |

Since maintenance of the water cycles of a power plant is essential for its performance, the quality of the piping system is of great importance.

The transportation of chemicals can conveniently be realized by corrosion free thermoplastic piping systems from Georg Fischer Piping Systems. The individual material choice, design and layout is depending on the chemical, its concentrations and ambient conditions of installation. Along with the required metering and monitoring instruments, GF is able to offer and provide an extensive program of all required components for a comprehensive layout of a piping system.

Basic chemicals are often handled in bulk or IBC, thus need to be transported either to a dilution or directly to the dosing point. Specialty chemicals may in times be dosed directly from a drum by a dosing pump.

In the majority of the cases of transportation of the mentioned chemicals, a detailed material recommendation is contingent upon the individual concentration and process conditions. Therefore an individual and detailed recommendation should be requested from the GF ChemRes department.

The GF Chemical Resistance team provides the individual material recommendation based upon an extensive pool of material data and a long experience of GF in the matter. Additional information can be obtained from the online-tool ChemRes Plus. It provides not only a broad spectrum of chemical resistance profiles on plastics and metals, which are used in GF items. It also gives relevant technical information to facilitate the understanding of the nature of different plastics and their properties.

**Table 2:** Trade name group of chemicals used in Power Plants

| Representative specialty chemicals for power plants: | | | | |
|---|---|---|---|---|
| Specialty Chemicals | Chemistry | Delivered Concentration | Application area | Piping material |
| Phosphonates | Phosphonobutane tricarbonic acid, aqueous solutions | ca. 30 % | Scale inhibition, hardness stabilisation and dispergation | PE, PP and PVC-U. |
| Disinfectants | Peracetic acid, chlorine dioxide, sodium hypochlorite | ca. 15 %<br>max. ca. 0.2 %<br>ca. 12 % | Cooling water treatment | PVC-U and / or PVDF, but dependent on type of disinfectant and conditions. |
| Heavy metal complexing agent | Sodium dimethyldithio-carbamate | ca. 20 | Heavy metal precipitation in flue gas scrabbing | PE and PP. |
| Heavy metal complexing agent | Trimercapto triazine, trisodium salt | ca. 15 % | Wasterwater treatment, flue gas scrabbing, Heavy metal precipitation | Only PE and PP! |
| PAC | Polyaluminium chloride | ca. 40 % | Flocculating agent | No restrictions for GF thermoplastics |
| Polyacrylates | Aqueous solutions | ca. 30 % | Scale inhibition, hardness stabilisation and dispergation | No restrictions for GF thermoplastics |
| Flocculants | Polyacrylamide copolymers | ca. 0.5 % | Wastewater treatment | No restrictions for stock and feed solution for GF thermoplastics |

For more details please refer to www.gfps.com/energy
The recommendations given in the charts should only be taken as a guideline.

**Your contact**

Georg Fischer Piping Systems Ltd.
Ebnatstrasse 111
8201 Schaffhausen
Switzerland
www.gfps.com

Sanjay Patel
T +41 52 631 39 09
sanjay.patel@georgfischer.com