SCIC
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PreDigest

Cooling Water Treatment 101

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Why should I understand my cooling tower water treatment program when I have my water treatment vendor to do that?

Proper cooling tower water treatment is key to ensure reliable and uninterrupted operation of the cooling water system and a long service life span of the associated equipment e.g. pumps and heat exchangers and piping.

Knowing the right questions to ask your water treatment vendor gives you confidence that they are working in your best interest and not just there to sell you chemicals. If something goes wrong with your water treatment program, you cannot simply point the finger at the water treatment vendor. Ultimately, the company running the equipment is accountable which could be you!

There are 4 areas of control in relation to cooling water treatment i.e. scale control, corrosion control, biological control and sediment control.

Scale control

Calcium carbonate and hardness salts may precipitate if solubilities are exceeded. Precipitated deposits may coat heat exchangers tubes, reducing heat transfer efficiency and increasing the risk of under deposit corrosion. Parameters to monitor scale control include pH, conductivity, calcium hardness, silica, filtered and unfiltered orthophosphate, alkalinity, Langelier Saturation Index (LSI).

Corrosion control

There are many types of corrosion e.g. pitting, galvanic corrosion, crevice corrosion, stress corrosion cracking, microbiologically influenced corrosion etc. Corrosion inhibitors can be passivating (anodic) inhibitors e.g. orthophosphate, chromate, nitrite, molybdate or precipitating (cathodic) inhibitors e.g. zinc, calcium phosphate, calcium carbonate. Orthophosphate is a common chemical used in open recirculating systems such as cooling towers given that it acts as both a passivating and precipitating inhibitor. For copper and its alloys, triazoles such as benzotriazole and tolytriazole are used. Parameters to monitor corrosion control include pH, iron and/or copper depending on materials of constructions, inhibitor concentration, filtered and unfiltered orthophosphate, corrosion coupons and online corrators.

Biological control

Cooling water systems have favourable conditions i.e. warm and wet for biological growth. Biological growth can lead to fouling and potentially accelerated corrosion. Scale and corrosion inhibitors will not function effectively in the presence of biological growth. Typical biocides include chlorine, sodium hypochlorite, bromine, ozone and non-oxidising organic biocides. Parameters to monitor biological growth include biocide concentration, standard plate count in colony forming units (cfu)/ml, legionella count (legislative requirement in Singapore).

Sediment control

Sources of suspended solids in cooling water can be from the make up water or precipitated solids from the water treatment program. A high suspended solids concentration would increase the risk of under deposit corrosion or accumulate in cooling tower basins to the point of having circulating pump flow issues. An effectively functioning sidestream filter is important in maintaining the Total Suspended Solids (TSS) levels within controllable levels.

Reference

1) Suez Handbook of Industrial Water Treatment Chapter 31
https://www.suezwatertechnologies.com/handbook/chapter-31-open-recirculating-cooling-systems

Process Safety is Everybody's Responsibility!

An initiative of the Process & Engineering Committee

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