CHEMTEX
INTERNATIONAL CHEMTEX CORPORATION

Technical Topics

Chemical Feed Systems and Equipment

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The results of many water treatment programs ARE often affected by the method of chemical application and location of the feed point in the system. For optimum results and cost effectiveness, the following feed points are recommended:

BOILERS

The following charts indicate options for primary, secondary and tertiary chemical feed points for the commonly used chemical products in the marketplace today.

Oxygen Scavenger Feed points

PRODUCT	DA/FW TANK	BOILER FEEDWATER LINE AFTER PUMP	BOILER
Sodium Sulfite	Primary	Secondary	Tertiary
Hydrazine	Primary	Secondary	Tertiary

Return Line Treatment Feed points

PRODUCT	STEAM HEADER	BOILER FEEDWATER LINE AFTER PUMP	BOILER
Diethylaminoethanol	Primary	Tertiary	Secondary
AMP(2 Amino, 2 Methanol, 1 Proponal)	Primary	Tertiary	Secondary
Cyclohexylamine	Primary	Tertiary	Secondary
Morpholine	Primary	Tertiary	Secondary
Octadecylamine	Primary Only		
Ethoxylated Amidazylene	Primary Only		

Boiler Treatment Product Feed points

Product	Boiler	Boiler Feedwater Line After Pumps	Boiler Feedwater Tank or DA Storage Tank
Carbonate Cycle Products	Primary	Secondary	
Phosphate Cycle Products	Primary	Secondary	
Alkalinity Supplement	Primary	Secondary	
Sludge Conditioners	Primary	Secondary	Tertiary
Anti-Foams Adjuncts	Primary	Secondary	Tertiary
♦Chelants	Secondary	Primary	Not Recommended

♦ Chelants require special application concerns. When using chelant products, the chemical feed system and boiler feedwater must meet the following criteria:

ITEM	COMPOSITION

Chemical Solution Tank	Polyethylene or stainless steel
Agitator	Low speed - 120 rpm
Chemical Tank Cover	Floating cover or deoxygenate with sulfite
Pump Suction/Discharge Piping	Plastic or stainless steel
Pump Selection	Piston or diaphragm
Pump Head	Stainless steel or glass filled polypropylene
Injection to feed line	Stainless steel quill to pipe or corporation stop assembly
Boiler feedwater line from injection point to steam drum or shell	Stainless steel preferred (not mandatory) Black iron acceptable, do not use copper

Just as feed points are important, so is the method of application. Most low pressure steam boilers are equipped, as a minimum, with a shot feeder system which allows direct chemical feed to the boiler or the feedwater system. "Shot feed" methods of chemical application are considered to be the most simplistic.

Automatic chemical feed begins with the implementation of chemical feed pumps. Although chemical resistant polyethylene tanks are normal, they may not be practical for high pressure boiler systems. Their temperature limit is 120°F, and most boiler chemicals should be mixed with hot condensate or feedwater. If polyethylene is used, white tanks must be protected from sunlight. Prolonged exposure to ultraviolet light causes white polyethylene to fracture. Black polyethylene does not present this problem.

Copper is often used for chemical feed lines, because it is easily installed and can withstand pressure associated with more sophisticated systems. Chelants and amines are very aggressive to copper. It is not a good practice to recommend copper chemical feed lines.

The options are varied, but it is widely held that the best results come from automated proportional chemical feed.

THE PROPORTIONAL FEED SYSTEM	Water Meter Timer Pump Automatic Blowdown Control

This feed system will eliminate variables in chemical usage as percentage of load, percentage of make-up or length of running time. The feed rate is directly proportional to water use.

THE BOILER RATIO FEED SYSTEM	Pump Dilution Tank Water Meter-Optional

A continuous feed system is designed to feed small amounts of chemical on a continuous basis. The chemical feed pump is wired to the boiler water feed pump. Every time the boiler calls for feedwater, small amounts of a concentrated mixture of chemical are added while the feedwater pump runs. If the boiler water feed pump does not run, chemical is not added.

This system will provide constant chemical treatment levels 24 hours per day. For best results, this system should be used with a standard water meter so that exact feed rates can be maintained.

Materials of Construction

High Pressure Boiler Systems

Chemical feed systems for commercial and industrial boilers are a function of system pressure and complexity. Normally, high pressure steam systems will have a standard package feeding unit consisting of a steel tank with piping, fittings and shutoff valves. Relief valves, the agitator and its propeller, are stainless steel. Pump parts include piston, discharge check valve assembly and suction check assembly, again either 303SS, 316SS or Carp20.

The pumps are stainless steel trim with machined steel or cast iron liquid ends. The term "stainless trim" means all wetted parts that are subject to friction or movement are made of stainless steel. It is good professional engineering to recommend that a customer purchase appropriate spare part kits at the time of making the initial pump purchase.

Low Pressure Boiler Systems

These systems may have a simple feedwater tank that collects condensate and makeup. The tank is vented to the atmosphere. In softwater applications, all boiler chemicals are fed into this tank using a standard diaphragm pump. The recommended materials of construction for all wet ends is glass filled polypropylene, ceramic ball valves and Teflon seats. Discharge tubing can be polyethylene as long as temperature limits are not exceeded.

When hardwater is used for makeup, phosphate based products must be injected directly to the boiler. This will require a standard injection assembly with sufficient black iron piping to shield the polyethylene tubing from temperatures above 120°F.

COOLING

Cooling systems usually utilize four types of chemicals for control of scale, corrosion and microbiological growth.

PRODUCT	RECIRCULATING LINE AFTER BLOWDOWN	TOWER BASIN
Corrosion Inhibitor	Primary	Secondary
Deposit Control Agents	Primary	Secondary
Biocides	Primary	Secondary
♦ pH Adjustment Chemicals ♦ Acids	Primary (use acid resistant injection/corporation stop)	Secondary

Standard methods for feeding cooling water products include:

CYCLE CONTROL	Bleed-off Controller Chemical Pump Bleed Solenoid

Chemical feed and system bleed-off occur simultaneously. Special attention must be made to assure chemicals are not lost during blowdown.

METER TIMER CONTROL	Water Meter/Timer Bleed-off Controller Chemical Pumps Bleed Solenoid

Chemical feed is initiated independent of bleed-off by a command from a make-up water meter with a contacting head.

pH CONTROL	On Line pH Monitor with Lockout Timer

This system must be coupled with a limit switch or lockout switch to assure safety. Acid feed should never be controlled with a cycle control system.

Materials of Construction

Since most cooling water chemicals are usually acidic in nature (unless neutralized), polyethylene tanks are used for mixing. We recommend glass filled polypropylene for all wet ends on pumps. Ceramic ball valves and Teflon seats are impervious to most kinds of chemicals used in cooling systems. Feed lines are most commonly polyethylene or schedule 80 rigid PVC. Care should be taken to protect these lines especially if they carry 66° Baumé sulfuric acid. Stainless steel tubing can be used for acid feed lines. It is recommended that either 304 or 316 be used and that it be no larger than ½ inch diameter. Do not use copper for chemical feed lines.