Water Treatment Services

S.P. THERMAL SYSTEMS INC.

New and Used Boiler Sales

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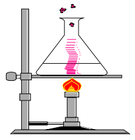
WATER TREATMENT CHEMICALS AND SERVICES



Water Treatment Chemicals for Boilers - Cooling Systems
Total Energy Consulting on - Water - Fuel - Chemicals
Call us for a full review of your Heating / Cooling System

NEW & USED BOILERS & ACCESSORIES

Distributor for: Hurst & Unilux (LWV) Boilers
Agent for: Coil - Low Volume - Firetube Boilers
Special Burner Controls - Pumps - FD & BD Tanks

Water Treatment Calculations Boiler Systems

FW = Feed Water **MU** = Make up **BD** = Blowdown
TDS =Total Dissolved Solids **C** = Cycles of Concentration
TDS can be measured using specific conductance in mmhos

% MU = (FW TDS) / (MU TDS) x 100
% Condensate Returns = 100 - % MU
Boiler Cycles = (Boiler TDS) / (FW TDS)
% BD = 100 / Boiler Cycles
FW lbs per hr = (Steam lbs / hr) / { 1 - (%BD / 100) }

Cooling Systems

E = Evaporation in GPM **C** = Cycles

E per min = Delta Water Temp across Tower x Pump GPM / 1000
C = Tower Water TDS / MU Water TDS
Blowdown per min = { Evaporation per min / (C - 1) }
Tower MU per min = Evaporation per min + Blowdown per min
1 Ton Refrigeration = 12000 BTU / hr for Chiller Evap.
1 Ton Refrigeration = 15000 BTU / hr for Tower Evap.
1 Ton Refrigeration = 3 US GPM circ. rate @ 100% Load

Estimating Cooling System Water Volume

Small Size System Volume = 3 x pump circ. Rate in GPM
Medium Size System Volume = 5 x pump circ. Rate in GPM
Large Size System Volume = 10 x pump circ. Rate in GPM

Softener Calculations

PPM Hardness in Water = Grains per US gallons x 17.1
PPM Hardness in Water = Grains per IMP gallons x 14.3

Miscellaneous Conversions

1 Foot = 0.3048 Metres
1 PSI = 2.31 Feet of Head of Water
1% = 10,000 PPM
1 PPM = 1 mg / Litre
1 Lb / 1000 US Gallon = 120 PPM
1 LB / 1000 IMP Gallon = 100 PPM
Deg. C x 1.8 + 32 = Deg. F (Use only above 0 Deg. C)

Liquid Measurement

1 US Gallon = 3.785 Litres
1 US Gallon = 0.83267 Imperial Gallon
1 US Gallon = 8.345 Lbs of water
1 Cu Metre = 220 IMP Gallons
1 IMP Gallon = 4.546 Litres
1 IMP Gallon = 10 Lbs of Water
1 IMP Gallon = 1.2 US Gallon
1 Cu Metre = 264.2 US Gallons

Cooling Systems Energy / Water Saving Tips

1 Maintain recommended bleed (TDS) control in the Tower
2 Prevent scale forming on heat exchanger
3 Maintain tight water control in closed loops
4 Maintain a system free from bacteria and fouling
5 Stop all water leaks or over flow on Cooling Tower
6 Use Automatic Chemical and Blowdown control equipment
7 Clean Tower spray nozzles at least once per year
8 Install filtration system on Tower and back wash regularly.
9 Install and change by pass filters on closed loops regularly.
10 Inspect and clean condenser tubes at least once per year

Efficiency Loss Tables

Boiler Scale Deposit Thickness

Scale Thickness	% Eff. Loss
1 / 32" Scale	8%
1 / 8" Scale	25%
1/ 4" Scale	40%

Soot Deposit Thickness

Soot Deposit	% Eff. Loss
1 / 32"	2.5%
1 / 16"	4.5%
1 / 8"	8.5%

Boiler Purge Loss

This is the number of times A Boiler Starts in **(1)** Hour. Each time a boiler stops/starts air is injected, releasing heat.

No of times / hr	% Eff. Loss
2	2%
5	8%
10	30%

Radiation Loss

This is the stored Boiler Energy That is lost at Operating loads (Size Boilers to suit load, to reduce loss)

Boiler Type	% Boiler Load 100	50	25	10
Coil Boiler	1%	2%	4%	10%
Flex Tube	1%	2%	4%	10%
Fire Tube	2%	4%	8%	20%
Water Tube	2%	4%	8%	20%

Steam Loss from Leaks: (Lbs / hr) at Operating Pressure

Hole Size	15 PSI	100 PSI	150 PSI
1/8"	14	53	76
1/4"	55	211	303
3/8"	123	475	682
1/2"	219	844	1212

Key Engineering Energy Concepts to consider when Operating a Boiler.

- Optimizing Combustion Efficiency, by minimizing excess air, and maintaining regular burner calibration tune up checks
- The use of Linkageless burner controls and possible Return to Pilot options can reduce purge loss & improve system efficiency.
- Maintain clean Boiler Heat Transfer surfaces through proper Water Treatment will reduce fuel usage.
- Proper control of boiler blowdown, will offer fuel, chemical and water savings, & prevents steam carryover which will reduce steam temperatures at the process, resulting in longer heat up times during production
- Returning all your non contaminated condensate water, reduces chemical, water & lower your fuel consumption.
- Installing Boiler Economizer to capture stack heat loss will increase boiler efficiency by reclaiming waste heat in most applications.
- Using High purity feed water such as Reverse Osmosis, dealkalizer will offer higher boiler cycles reducing boiler blowdown offering savings in fuel, water and chemicals. Total overall savings ROI should be done to evaluate potential payback.
- Conducting periodic trap review to identify failed or leaking traps will reduce energy losses throughout your system.
- Identify and repair steam leaks in piping, valves & fittings will reduce substantial heat and energy losses.
- Insulating steam piping, feed water tanks, deaerators & hot process equiment. will provide fuel savings.
- Evaluating boiler systems & capturing energy loss from Steam Vent discharge - boiler blowdown recovery - waste heat recovery capturing the heat off boiler stacks with an economizer to preheat feed water will reduce energy losses offering savings in fuel reducing your operating cost. Carrying out a Full Energy audit of your operation with ROI is recommended when trying to improve system efficiency

Typical Boiler and Steam System Failures that occur.

- **Steam Blanketing**- Caused by poor water circulation from overfiring, or running boilers below the design operating pressure can result in localized tube overheating. This failure results in tube distortion and burn out from lack of water flow through the tubes..
- Boilers that do not have a **stack damper**, the cold air from the stack could freeze water in winter shutdown resulting in tube rupture
- **Oxygen Pitting** on boiler tubes is the result of dissolved oxygen in feed water that is not removed. This will attack, economizers and boiler tubes, resulting in localized pit holes occuring. On Firetube boilers pitting can occur where tube sheet and tube meet. Disolved oxygen is trapped at the tube sheet from the expansion and contraction as the tube flex due to thermal expasion. Normally oxygen pitting is observed where the cold water enters the boiler resulting in flashing off any remainig oxgen that was not removed by chemical
- Boilers that have **hardness scale** build up could have a tube burst from the calcium scale plugging the water circulating through tubes
- **Acid left** in a boiler after an acid wash cleaning procedure can cause the tube metal to fail. Flushing of acid out of system is important
- **Copper / Yellow metals** used in a condensate system will dissolve over time resulting in possible galvanic initiated anodic pitting on boiler tubes. Never use copper / yellow metals in a steam system. Reason it will not stand up to high / low pH in boiler systems.
- Maintaining pH of 7.8 – 8.6 in the **returning condensate** will reduce carbonic acid corrosion in condensate piping. Review amine used.
- **Use only Stainless-Steel** feed water check valves, pumps & economizer tubes to improve durability and reduce frequently replacement of units.

Boiler Calculations

BHP = Boiler Horse Power **BTU** = British Thermal Units

1 BHP = 34.5 lbs / hr @ 212 F (Zero Pressure)
1 BHP = 33479 BTU / hr @ 100% Efficiency
1 BHP = 9.81 Kilowatts / hr
1 BHP = 15.65 Kilograms / hr
1 BHP = Approx. 4 US gall / hr evap. @ 100% Load
1 BHP Requires approx. 0.2 US GPM Feed Pump Size
1 BHP Requires approx. 1 US gallon Feed Tank Size
BTU / hr Required = 500 X US GPM X Temp Rise Deg F
BTU to raise Water Temp. = Lbs of water x Temp. Rise Deg F
BHP Required = BTU required per hour / 33479
Cu Metres / hr of Nat gas = BTU required per hr / 35456

Heating Value of Various Fuels

1 Cubic Foot Nat Gas = 1004 BTU
1 Cubic Metre Nat Gas = 35456 BTU
1 Litre Propane = 24207 BTU
1 Litre No 2 Oil = 36955 BTU
1 Kilo Calorie = 3.96825 BTU
1 GJ Nat Gas = 948214 BTU
1 Cubic Foot Nat Gas = 0.02832 Cubic Metres
1 Cubic Metre Nat Gas = 35.315 Cubic Feet
1 GJ Nat Gas = 26.7434 Cubic Metres

Pressure

1 Bar = 14.5 PSI
1 Inch Water Column = 0.03614 PSI
1 Kilogram / sq cm = 14.22 PSI
1 Inch Water Column = 0.249 K Pa
1 PSI = 6.895 K Pa

Weights

1 Lb = 454 Grams
1 Kilogram = 2.2 Lbs
1 IMP Gallon = 160 Fluid ozs
1 US Gallon = 128 Fluid ozs
Kgs = Litres x Specific Gravity of Product

Boiler Fuel Approx. Usage @ 100% Load

1 BHP will use 41.68 Cubic Feet Nat. Gas / hr @ 80% Eff.
1 BHP will use 1.1804 Cubic Metres Nat. Gas / hr @ 80 % Eff.
1 BHP will use 0.3 US GPH of # 2 Oil @ 80% Eff.
1 BHP will use 1.73 Litres of Propane / hr @ 80% Eff.
1 BHP will use 9.81 Kilowatts / hr (Electric 100% Eff)
Note: For actual Fuel usage other factors have to be Taken into consideration. (FW Temp / Pres. / Load / Eff.)

Boiler Energy / Water Saving Tips

1 Control Boiler blowdown at Max. TDS recommended
2 Return the maximum condensate possible
3 Maintain a scale free Boiler
4 Carry out fuel to air combustion checks regularly
5 Size / match Boilers to suit loads when possible
6 Pre heat combustion air & have adequate air for combustion.
7 Insulation should be on all steam pipes and flanges
8 Do not run higher steam pressure than required
9 Recover flash steam, and pre heat feed water.
10 Repair steam leaks & carry out regular trap maintenance

Boiler & Cooling Chemicals **Steam & Hot Water Boiler Sales**