

Aquarius Technical Bulletin - No. 06

Neat Dosage of Inhibitor Chemicals on Comfort Cooling Systems

The vast majority of inhibitor chemical formulations are supplied as liquid formulations and can be dosed direct from the container as supplied, eliminating bulky chemical tanks, and wastage of manpower in refilling chemical tanks.

The actual dosage rate of Inhibitor required on comfort cooling systems (usually 100 ppm) is small, and in the range of 0.2 mls./hr. to 200 mls./hr., however the majority of common magnetic pulse dosage pumps on the Australasian market do not provide low enough dosage rates to eliminate the need for dilution of chemicals and bulky chemical tanks.

The table to the right **Continuous Inhibitor Dosage Mls./hr.** shows the mls./hr. of Inhibitor required to be dosed on a continuous basis, at various loads and various concentrations in the cooling system. This table indicates a dosage pump rated at 200 mls./hr. maximum with a minimum turndown ratio of 100 - 1 would be ideal for 95% or more of applications, however the majority are rated 1000 mls./hr. See table to the right - **Common Dosing Pumps - Australian Market.**

Aquarius Technologies Pty. Ltd. has pioneered the capability to dose neat chemicals by two important innovations, since 1989 by incorporating inhibitor dosage into the CT520 range of conductivity controllers and building in circuitry to provide for timed DUTY CYCLE on Inhibitor dosing of 100%, - 20% (effectively a dilution to 20%) and 5% Duty (effectively a dilution to 5%) at the flick of a switch, and secondly in the design of the AT522 & AT533 dosing systems where circuitry was built in to Duty Cycle the Inhibitor dosing pump to allow for dosage rates from 500 mls./hr. down to 0.25 mls./hr. - again by simple switch or by keypad selection.

Competitive Cooling Tower dosing packages seldom provide for Duty Cycle timing on inhibitor dosing, will require the installation of bulky chemical tanks on systems, increasing costs and man-hours to service, .

Considering winter or low load conditions, then the majority of comfort cooling systems will require bulky chemical tanks and dilution of chemicals if an Aquarius AT522 or AT533 controller package is not the controller of choice.

Duty Cycle timing on Inhibitor dosage avoids the need for dilution, bulky tanks in the plant room, and the time to dilute the chemicals in the tank with a hose.

Continuous Inhibitor Dosage Rate in Mls./Hr.

kWR Load	Concentrations in Cooling System				
	30 Mls./hr.	20 Mls./hr.	10 Mls./hr.	5 Mls./hr.	3 Mls./hr.
25 =	0.13	0.20	0.43	0.97	1.93
100 =	0.53	0.81	1.72	3.87	7.74
500 =	2.67	4.07	8.60	19.3	38.7
1000 =	5.3	8.1	17.2	38.7	77.4
5000 =	26.7	40.7	85.9	193	387

Common Dosage Pumps - Australian Market

Supplier	Model	Dosage Rates	
		Maximum Mls./Hr.	Minimum
Acromet	DL/LISE	1000	18.0
Acromet	DLPK	1000	96.0
Meterpump	IMB0110	1000	18.0
Meterpump	IDB0207	2000	40.0
Prominent	CON1601	1000	23.0
Prominent	ALP1001	1000	200.0
Pulsafeeder	LD02	970	10.0
Pulsafeeder	LPK2	440	5.0
Aquarius	AT522	500	0.25

Common Dosage Pumps - Australian Market & using an Aquarius controller, with the Inhibitor Duty Cycle set to 1.0%

Supplier	Model	Minimum Dose Rate	
		Minimum	Maximum
Acromet	DL/LISE	0.18	mls/hr.
Acromet	DLPK	0.96	mls/hr.
Meterpump	IMB0110	0.18	mls/hr.
Meterpump	IDB0207	0.40	mls/hr.
Prominent	CON1601	0.05	mls/hr.
Prominent	ALP1001	2.00	mls/hr.
Pulsatron	LD02	0.10	mls/hr.
Pulsatron	LPK2	0.05	mls/hr.

Competitive Cooling Tower Control Packages not using Aquarius Controllers will have minimum dosage rates equal to 100% duty above and will require chemical tanks and chemical dilution on all but the largest of plants.

Is the Inhibitor Chemical Container sufficient storage for 1 months supply.?

Notes

Normally the inhibitor is supplied in 15 or 25 litre containers and the usage rate of inhibitor can be calculated from the maximum expected load, the concentrations to be maintained in the cooling system, and monthly hours of operation, or from the table below.

kWR Load Operating	Based on 84 hrs./week operation				
	Concentrations in the Cooling System				
	30	20	10	5	3
	Monthly Litres of Inhibitor @ 100 ppm in the system				
500 Kw	1	1.5	3.1	7	14
1000	2	3	6.2	14	28
2000	4	6	12.5	28	56
4000	8	12	25	56	112
6000	12	18	38	84	168

For 24 hours/day 7 days per week operation - the above figures are multiplied by 2.

Dosing Pump - pressure rating required for the particular installation . ?

The dosing pump is required to lift the chemical solution from the container and inject the solution into the cooling system water. As inhibitor solutions in the concentrated form vary in pH value from Acidic e.g. 3.5, to very Alkaline e.g. pH 13.0 - dosage into a PVC manifold of the neat inhibitor and subsequent dilution by flow in the manifold, or dosage direct to the tower basin in an area of mixing is highly desirable. (note that dilution of the inhibitor to 5% in a chemical tank does not drastically change the pH values)

Where the dosing equipment is sited in the vicinity of the cooling tower and the manifold return, or chemical injection is into the tower basin, then the pressure required from the pump is equal to the circulating pump pressure to the manifold, and is seldom, if ever in excess of 250 kPa. and the Peristaltic dose pumps are capable of injecting against this back pressure. **This range is covered by the current AT522/WM522 & AT533/WM533 control systems.**

Where the dosing equipment must be located in a plant room, (e.g. High Rise Buildings with the cooling tower many floors above), and where the dosing manifold is plumbed across the condenser pump common discharge header and suction, then the maximum pressure at this point must be taken into account and a dose pump having a pressure rating in excess of this pressure amount selected, usually a magnetic solenoid pulsed dosing pump - which have pressure ratings of 150 kPa to 2100 kPa dependant on pump and flow rate selected. **These ratings are made available in our - 2P (3 pin sockets) or - G (Glands) range of control systems.**