Review
5/92

SOP 20

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EDC/VDCM COOLING TOWERS

Often times the cooling towers seem a trivial part of plant operations, and due to the seldom need for attention, the aforementioned is somewhat justified. But in reality, the cooling tower system is a vital necessity in the chemical process. The loss of cooling water to process condensers can cause extremely high pressures on distillation columns resulting in environmental releases, out of spec product, or worse, injury. Therefore, careful attention to basin levels, pump and fan operation, and water temperature are an extremely important part of the operators daily rounds.

OPERATION

Cooling tower water is pumped through process condenser via a total of eight (8) pumps. The basins of nos. 1,2 & 3 towers are equalized through a common suction line and have six (6) pumps associated with it (of which there are normally only 4 - 5 pumps in service at any one time [a minimum of 4 pumps should be used to insure sufficient water flow to the condensers]). Number four (4) cooling tower has a separate suction and return line from nos. 1,2 & 3, and has two (2) pumps on it's suction (of which only 1 pump at a time is needed for normal operation). There is a suction and a discharge tie-in between the two sets of towers which can be used to optimize tower performances when the heat load is unbalanced.

Towers one, two, and three supply water to the process condensers in the two EDC plants, TCE section, and the D.H. still. Number four tower supplies water to the VDC Reactor, VDC Still, old no.3 EDC plant, and the TCE Stripper product exchangers. Due to the small heat load assigned to number four cooling tower, the basin temperature is noticeably lower than that of nos.1,2 & 3. Therefore it is advantageous to distribute some of number four tower's water to the processes that are cooled by the other three towers. This is done by the suction/discharge tie-ins mentioned earlier, and also by a tie-in by which number four cooling tower water (that has passed through the VDC Reactor and VDC Still condensers) is routed through a booster pump and discharged to the supply line of the other towers. This tie-in is located in the VDCM area.

NOTE : Due to the high amperage draw on nos. 7 & 8 and the booster pump, **you should not attempt to run more than two (2) of the three pumps at any one time.** Number four 480V

bus cannot handle the load and will trip off. The normal amperage draw on pumps 1 through 6 is approximately 75 amps, nos. 7,8 and the booster pump average approximately 175 amps.

If an amperage draw of less than fifty (50) amps is noticed on pumps 1 through 6, or less than 150 on 7,8 & the booster pump, then the pump is not operating at it's capacity and should be attended to. If the pump cannot be primed due to a malfunction, it should be isolated and reported to the unit foreman for repairs, and another pump should be put in service if needed. For priming purposes, an aspirator line (which is driven by well water) is hooked to the bowls of each pump. This aspirator line is not to be put in service until it is needed due to the fact that the well water used is discharged to the cooling tower basin and is not a suitable make-up water except in an emergency.

The level in the cooling towers is maintained by two level control valves (one on tower no.2, and one on tower no. 4 tower) which supply treated Sabine River water to the towers for level control. There are high and low level alarms located on the EDC panel board for towers number three and four. As stated earlier, loss of cooling water is critical, therefore a low level alarm on the towers should be attended to without delay. If for some reason adequate Sabine water is not available for make-up, well water can be used. In case of emergency a fire hose or sprinkler system can be used to restore tower level to normal operation. Another source of make-up water is the return water from no.1 and no.2 EDC freon condensers. These condensers have the capability of using either Sabine or cooling tower water. When on Sabine water their returns are extra make-up and may need to be diverted to the ditch if tower levels exceed the high alarm point.

NOTE: When these freon condensers are on cooling tower water diversion to the ditch is in effect blowdown.

There are screens located at the suction pits of each tower which are used to filter the water and not allow trash or debris to enter pump suctions. When the screens become dirty a "waterfall" is created and screens must be cleaned. If screens go unattended, a vortex may form and allow air to be sucked into the pumps resulting in cavitation and loss of cooling on process conden ers. On the other hand, a high level alarm is not critical, but can be costly if towers are allowed to overflow (due to loss of expensive chemicals which are added to treat cooling water [see TREATMENT]).

Each tower has two (2) cells in which the return water is cooled for recirculation. The water is returned to the

top of the tower via the return risers and allowed to free-fall to the basin. There are numerous slats positioned so that the falling water is broken into droplets which allows the heat to be removed much easier than trying cool a solid stream of water. The cooling is provided by an updraft of air created by the fan located atop the tower cells; air is pulled in through the open section at the tower bottom and discharged through the fan exhaust. Each fan is equipped with a vibration switch which will cut the fan s power if vibration becomes too great, this is a safety feature which is designed to prolong the life of the fan and associated parts.

NOTE: In winter months, it is not unusual for ice to form on the slats inside the tower even though the return water temperature may be as high as 100-110 degrees F. If ice is noticed, the fan should be shut down on that cell as the tower structure is not designed to withstand the added weight of ice.

TREATMENT:

1) **CHLORINE**- Chlorine is used to minimize algae inside the tower itself. Chlorine is fed via a one-ton chlorine cylinder and an aspirator system. The controlling range for chlorine is 0.1-0.4 ppm

2) **PH**- The controlling range for PH is 8.0-8.4 and is controlled by adding soda ash to low PH water, and adding Sulfuric acid to high PH water. High PH's can lead to dissolved compounds losing their solubility and dropping out of suspension, thus becoming scale forming and may lead to exchanger fouling. Low PH's can erode the protective film on the metal and may erode the metal itself. Therefore, the PH must remain in the desired range to assure maximum protection from corrosion and fouling.

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