PROBLEMS FROM THE PLANT

Exercise your engineering wits by submitting answers to this question, fresh from the plant. Suitable material will be paid for; answers accompanied by sketches or photographs command additional pay.

How Can I Save Steam From Curing Cylinders?

TO CURE CONCRETE BLOCKS we use six cylinders, each 65 ft long and 6 ft in diameter. The blocks are stacked in the cylinders, which are then filled with live steam. The curing cycle consists of cooking for 2 hr at 12 psi, then gradually bringing pressure up to 100 psi and cooking for 4 hr. Steam is then exhausted to atmosphere in about 40 min. Only two cylinders are cooking at one time; the others are being filled or emptied. Each operation takes about 1½ hr.

Steam is generated in an hrt boiler having 2000 sq ft of heating surface. We draw raw water from the Detroit River for feedwater. At times we do not use the feedwater pump because we cannot keep steam up with cold water going into the boiler. We tried using an injector but it wastes a lot of time.

At present we are using about tons of 12,000 Btu coal in 24 hr. is fired by an underfeed stoker.

Can Power readers suggest some of using the exhaust steam so it will be a total loss? I thought of using it heat feedwater but don't know how make use of it in the short exhaust per of 40 min out of each 12 hr. Maybe engineer knows of a similar setup that has a good method for using waste ste

H W, chief engineer.

Readers' Answers

Why Does One Cooling Tower Take More Air?

(This question is from New Ideas with best answers from readers.)

We have two cooling towers, each designed to cool 1300 gpm of water from 105 to 85 F with a maximum wet bulb of 79 F. One is an induced-draft tower and the other a forced-draft.

The induced-draft tower is 18 ft wide, 32 ft long, and 25 ft high. It is equipped with three 7-ft disk fans operating at 325 rpm. Each fan, which has a 7½-hp motor, produces 46,300 c/m of air at ½-in. of water static pressure.

The forced-draft tower is 20 ft wide, 36 ft long and 26 ft high. It is equipped with two 11-ft aluminum-alloy adjustable blade fans operating at 250 rpm. Each of these fans requires 15 hp and gives 120,000 c/m of air at ½-in. pressure.

Decking of both towers is the same. It consists of six sets of 1½x6-in. rafters with 1x3-in. strips of wood, spaced 2ft, 3 in. apart and nailed on both sides of the rafters. Water is sprayed on the decking by 1½-in. nozzles at 5 psig.

I would like to know why the forced-draft tower requires about 72% more air and 30% more horsepower than the induced-draft tower.—HB

Calculate the Horsepower Output

A F-D TOWER REQUIRES more air because a certain amount of air handled is recirculated. Fans create a suction along the side of the tower, which tends to pull a certain amount of heated air from the top or exhaust side of the tower back to the inlet. Since this recirculated air does no cooling, or at best very little, it is necessary for the f-d tower to circulate more air.

The I-d tower naturally takes less power because the air is moving at a lower velocity. Another factor, which contributes to the power consumption of the f-d tower, is that air after leaving the fan must make a 90-deg turn, thus causing the fan to work against a higher head. This is not true in the I-d fan where the air is taken in at a lower velocity. Here, air makes the turn into the tower decking at low velocity. The fan discharge is directed in a straight line away from the tower.

Motor sizes are probably rated values, not actual horsepower consumed. I suggest that *HB* determine power actually used by each fan. Power input to each motor can be measured and the horsepower output calculated, using the input value and the motor efficiency. This latter can be obtained from the motor manufacturer's data. Fred W Weisenbach, Wayne, Pa.

Check Performance Of Both Towers

FIGURES GIVEN in the problem are design ratings only. *HB* should check actual power consumed by each tower. Compare water- and air-outlet temperatures, and relative humidities of outlet and inlet air for comparison.

Two manufacturers, or even one manufacturer at different times, may supply different towers to meet the same operating conditions. The nearest standard design at the time will be offered, and standard fans used. Also one manufacturer may provide a greater margin of safety as regards capacity, either as a matter of policy or a safeguard due to lack of experience. Again, higher power consumption with two fans may be compensated for by higher first cost and more maintenance of three fans. Motor sizes may give a false idea of the power, as motors are only made in a limited number of standard horsepower sizes. Thus, the three 7½-hp motors may be running overloaded but not enough to justify 10-hp motors; while the two 15-hp units may be consuming just enough power to make the use of 10-hp motors questionable.

An I-d cooling tower requires more power, not less, than a f-d. The exit velocity from the former is high, and is wasted power. But this reduces danger of recirculation of air. (See "Performance and Selection of Mechanical Draft Cooling Towers," by J Lichtenstein of Foster Wheeler Corp, in *Transactions, ASME*, October 1943.) An I-d fan passing the same weight of dry air as a f-d fan has to handle a greater weight of vapor and also a greater volume of air. This is the result of moisture and heat picked up by the air in passing through the tower, and also the draft loss in the tower. W L Govan, Brantford, Ont.

(*Continued on page 116*)

GAS COOLERS HAVE LONGER LIFE *with Anaconda* Arsenical Admiralty

HERE'S an interesting exchanger using extended surface for the more efficient cooling of gases. Built by the Griscom-Russell Company of New York, the heat transfer surface of this G-Fin Gas Cooler is made of Anaconda Arsenical Admiralty Alloy tubes and fins. The use of this alloy provides rust-proof, workable metal with special resistance to dezincification.

Arsenical Admiralty is but one of ten standard and several special Anaconda tube alloys for heat exchange applications. To help you select the alloys best suited for your needs, our Technical Department will be glad to assist you and make recommendations. Also, write for your copy of Publication B-2, which provides detailed information.

The heat transfer elements of this G-Fin exchanger consist of seamless tubes with longitudinal fins equally spaced about the circumference. Admiralty Alloy fins are thoroughly bonded to Arsenical Admiralty Alloy Tubes by a special mechanical process. This design gives six to eight times as much outer as inner surface—facilitating the transfer of heat from gas to cooling fluid.

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