JACKET WATER

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Very little information is available regarding the water necessary for the jackets in a modern copper blast furnace, or the amount of heat that is carried away by such water. It would be very interesting if some of those now engaged in such work would publish the figures for their particular plants. Where water is plentiful and cheap there is usually permitted to run through the jackets an excessive amount. The result is that the jackets are kept cold and a little more heat is lost from the furnace charge. The difference in the heat lost from the furnace when the jacket water is run cold and when run hot is really insignificant. Where, however, water is scarce, or the pumping an important item in the plant, the jacket water is run as hot as possible in order to cut down the water used or the pumping to be done. Economy in the use of water is difficult to enforce, as furnace men are apt to carry plenty of water in order to avoid the troubles from a boiling jacket.

Corrosion of pipes.—Jacket water may run to waste but is usually pumped back to the stock tank, from which it flows by gravity again to the jackets. If plenty of water is kept in circulation, or if a considerable amount of new water is introduced in the system, the temperature of the water may be kept down. This new water not only keeps down the temperature, but keeps down the acidity. Circulating water is bound to pick up considerable flue dust, which will contain soluble sulphates and some free sulphuric acid, and the result is that pipe lines are destroyed and pipe fitttings about the furnace, particularly nipples, are eaten through. So when new water is not available, we find the circulating water becoming acid and also hot.

Cooling towers.—In a country not troubled with frosts and where the humidity is low, the logical treatment for hot water is the cooling tower. Where the humidity is at all high, the cooling tower is, however, quite useless. Such towers are rectangular, with sloping sides, about 20 ft. high, having a sump at the bottom. The warm water is distributed from launders over its top. It may have, say, 20 storeys, the floors being of 1 in. stuff, about 4 in. wide, laid 4 in. apart. The boards are staggered so that the gap on one floor corresponds to the board above or below. Louvres protect the sides, and also permit free access of air. This free access of air is essential. and cooling towers are made narrow, to get efficiency, and long in order to get capacity. If wide, the central portion of a cooling tower does very little work. The capacity of a properly constructed cooling tower depends on:

1. The difference between the temperature of the water and the air.
2. The humidity of the air.

The capacity is conveniently expressed in B. t. u.'s per sq. ft. of wetted surface per minute.

The capacity of a cooling tower that was built too wide was found to be from 11 to 12 B. t. u.'s per minute per square ft. of upper wetted surface of slats when the difference between the air and water temperature was 30° F. and the humidity was 5 per cent.

The choosing of a site for a cooling tower is a matter of importance. In the first place it should occupy an exposed position, so that the air has free access, and its sump should be high enough to supply the furnace jackets. It should never be placed where sulphur smoke may be carried to it. If the wind carries sulphurous smoke to the tower, the falling water will become quite acid in a few hours.

The distributing launders should give a uniform distribution of water and should be provided with gates, so that their feed may be shut off and the accumulated mud and slime removed periodically.

When the jacket supply circulates with a minimum amount of new water it not only becomes acid; but will deposit in the dump of the cooling tower mud composed of fine dust, fume, ferric salts and insoluble sulphates. It will be necessary to renew the whole of the circulatory water occasionally. The dump should be accessible for cleaning on these occasions.

The most satisfactory neutralizer for jacket water acidity is sodium carbonate. The amount necessary to add may be calculated from a titration of a sample of the water. Although a small amount of arsenious acid in the water will protect iron in many cases; it does not seem to be effective in protecting pipes, etc., carrying jacket water.

The amount of heat carried away from a furnace through the jackets is not as large as might be supposed. This is due to the formation of a crust next the jacket, which will have a low heat conductivity. The hot jackets that would result when blowing in a furnace, if plenty of water were not used, is due to the absence of this crust. Some measurements taken by the writer over a month's operations showed that 4,750 ton calories per ft. of furnace length per day were lost in the water. This was for a plant smelting copper ore in the ordinary manner, with about 10 per cent. of coke on the charge. During the month 2,635 U. S. gals. per min. circulated for 8 furnaces, aggregating 111 ft. in length. In pyritic smelting, 1,490 ton calories per ft. of furnace length per day was found to be normal. The lessened heat loss is due to the thicker protecting crusts on the pyritic furnace.

INTERNATIONAL ENGINEERING CONGRESS, 1915

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