

METHOD OF MELTING AND POURING QUICK QUENCHED STEEL BALLS USED BY THE  
BRITANNIA MINING AND SMELTING CO. LIMITED

TYPE OF ELECTRIC FURNACE USED

GREENE 1 1/2 TON - 3 PHASE FURNACE HAS ACID LINING

AVERAGE BALL HEAT RUN IS 3 TONS PER MELT

SCRAP USED FOR BALLS

Scrap for the making of the Balls can be almost any kind of steel and iron scrap obtainable, so long as a combination is made that will give from 0.90 per cent to 1.10 per cent carbon.

We use mostly old rails, roll shells, car wheels, manganese scrap of all kinds, white iron, grey iron, cut cable, foundry returns, mill lining, shop clippings, auto scrap, general railroad scrap, and of course, all the iron and steel scrap and returns that is gathered up around the plant.

Steel in the high carbon class, naturally is preferred as there is less adjusting to gain the needed carbon content, also it saves low carbon scrap for the general run of work.

EXAMPLE OF AN AVERAGE 3 TON BALL HEAT

2,500 lbs	(Rail, drill steel, springs, chrome steel, or any high carbon steels found in the scrap pile.
700 to 1,000 lbs of iron	(Car wheels and white iron used. The amount of iron needed is governed by the amount of high carbon steel used.
1,000 lbs of returns	(On the average 3 Ton heat we get about 1,000 lbs (of gates and risers back, and these are used in (the next charge
2,000 lbs of Mild steel	(Generally this scrap is of the small variety to (use in packing around the larger scrap in the (charge.

We use manganese scrap in the ball charges, not that we find any particular advantage in having the manganese content in the balls, but it is just the means of being able to use any manganese scrap on hand.

#### LOADING FURNACE - AVERAGE TIME 15 TO 20 MINUTES

Some of the heavy scrap is loaded first, then the returns are put in, making a solid bottom to eliminate the danger of bridging. The rest of the heavy scrap is charged and the light scrap loaded last.

#### AVERAGE TIME TO MELT

If the furnace is loaded immediately after a heat the charge melts down and is ready to pour in one hour 45 minutes to two hours.

On a furnace shut down over the week-end it takes three to three and one half hours for the first heat based on the 3 Ton average melt.

#### ALLOYS IN CHARGE AND SCRAP

We have found by different experiments that chrome, manganese and other alloys in the scrap do not seem to have any advantageous effect on the wear of the balls, therefore the (carbon at 0.95% to 1.10%) silicon not over .60% is the most important feature of the furnace charge. Manganese - don't use over 1,000 lbs, in any one charge, as over that amount might be injurious to the furnace lining if it is acid. A small amount of aluminum is added to the ladle to take care of any excess oxygen causing wild steel.

#### POURING THE STEEL

A ladle is used holding 600 lbs which is preheated to a yellow heat before the pour by an oil fire.

Make sure the steel is good and hot, when the slag shows signs of a slight bubble effect, it's a good heat for pouring balls.

Balls are placed in rows on front and slide of quenching tank, ten boxes of balls to each row, one row is poured at a time.

#### TIME OF QUENCH

Six boxes of balls are poured, then the first box poured is dumped on the floor and thrown in to the tank, then the second, and so on always allowing for six boxes ahead, otherwise balls will be too soft when dumped and might possibly fracture the steel.

#### CONDITION OF QUENCHING WATER

Water must be cold as possible and kept in a circulating motion as much as possible.

Time to pour a heat of balls is generally 40 to 45 minutes, 4 minutes to the ladle. A 3 Ton heat pours 115 boxes, at 42 lbs, per box 4,830 of balls per heat.

#### MAIN POINTS TO WATCH IN REGARD TO MELTING METAL FOR THE QUICK QUENCHED STEEL BALLS

1. Carbon not under .90% and not over 1.20%. 1.005 is very satisfactory.
2. Put balls in tank as quickly as possible after being dumped on the floor, and after giving time to set in the mould so that the balls are not deformed in the handling.
3. Make sure steel is hot
4. Make sure ladle is hot.
5. Be sure a sufficient amount of cold water is going in the Quenching tank when quenching balls so that water is kept cool.
6. Throw balls in tank devoid of sand as much as possible.
7. Avoid throwing balls in the same spot in tank, if scattered they will cool better than if piled in one spot.