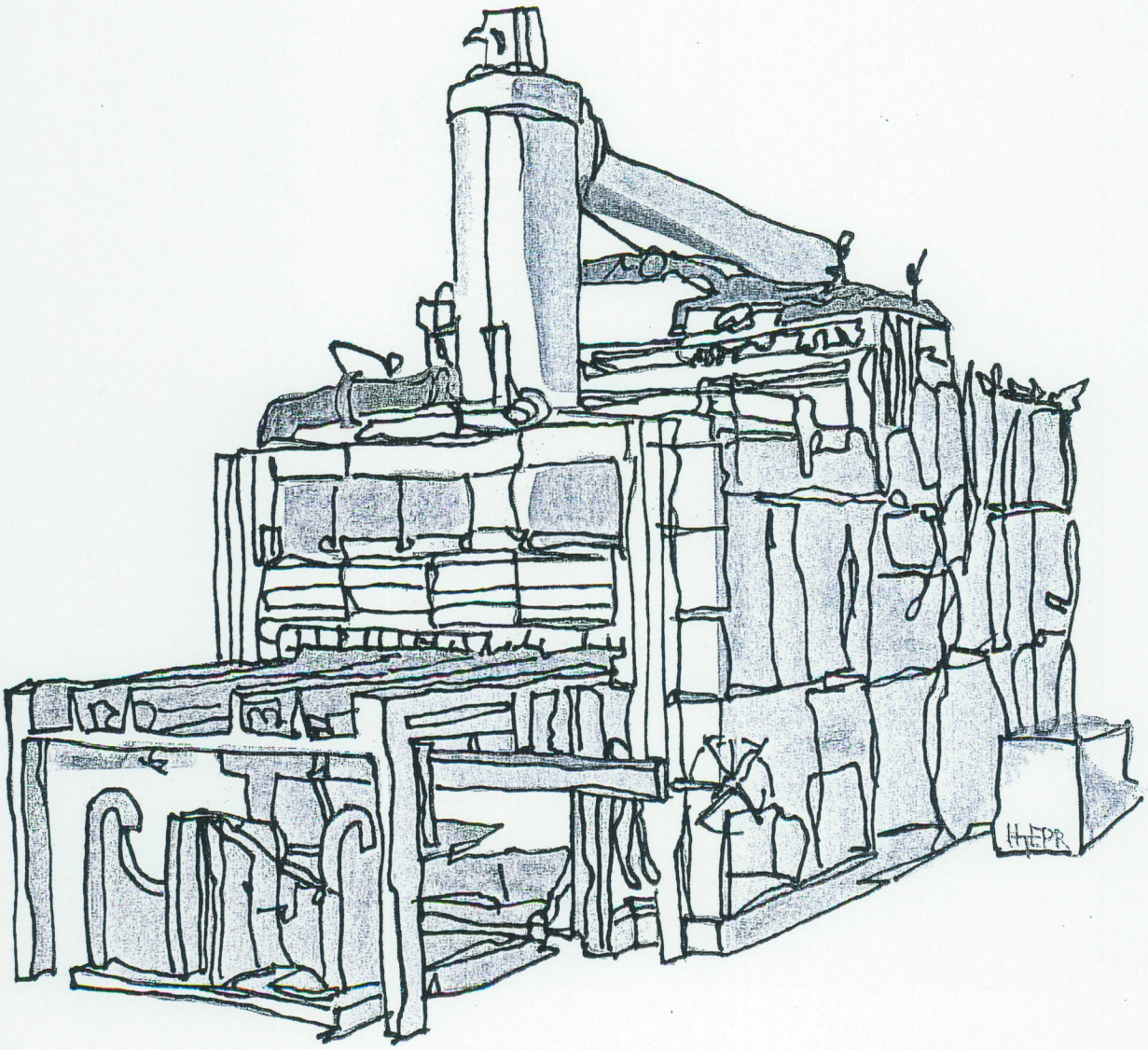
FK Technical Information 2009/2

FK INDUSTRIEOFENBAU +
SCHUTZGASTECHNIK GMBH

NEW

Electric, gas or oil fired Walking-beam furnaces



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New Walking Beam Furnaces for oil, gas and electric heating

INTRODUCTION

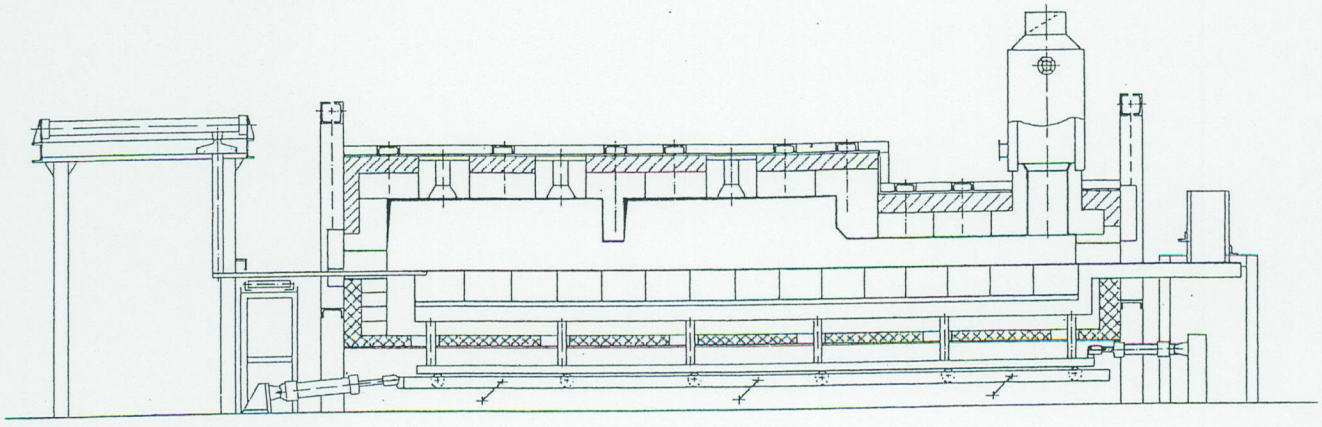
In case steel will be heated up to temperatures between 1100°C and 1300°C , which is needed in forging and hot forming, it is likely possible, that the surface of the material will build up a unwanted oxide layer (scale layer). The material loss of the workpiece due to this chemical reaction (heat waste) could reach values above 3% of the workpiece weight. This fact is of course a remarkable loss of money.

In addition to that unwanted fact, cost for removing the scale will bring up the cost level. In order to reach an acceptable exposure time of the costly forging tools, the surface of the workpiece is an important fact. Scale which has not been removed result in shorter lifetime of the forging tools as well as also in quality criteria of the workpiece itself. Small scaling particles can penetrate into the workpiece surface and can´t be hardly removed.

The total scale free heating up of steel in oil or gas fired furnaces is possible. To prevent unwanted oxidation of the material which will be heated up in the furnace, the furnace needs an inert atmosphere, since steel is sensitive to carburizing. It is important, that the workpieces, at least at a furnace temperature over 600°C will get only in contact with a furnace atmosphere which is reduced or neutral. Depending on the natural gas which is used in the furnace, the air figure should be between 0,4 to 0,5 in order to reach the required furnace atmosphere during the heating process.

PRESCRIPTION OF THE NEW WALKING BEAM FURNACE

The whole furnace unit consists of a charging unit with material store, the furnace itself with ceiling heating units and the walking beam drive. Additional to these standard components, a detarring system is also available on request.



Sectional drawing showing a modern Walking Beam Furnace

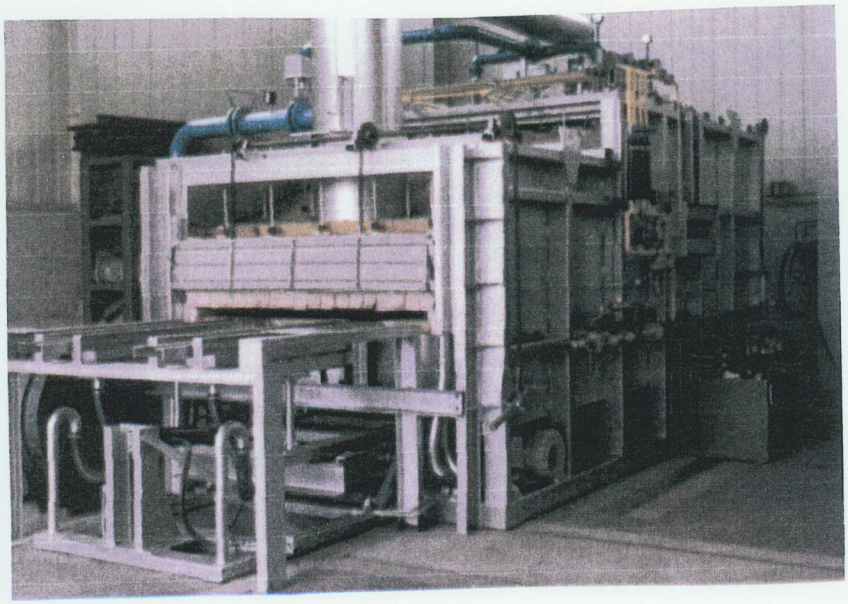
With the walking beam system all kind of materials can be transported through the furnace – i.e. forges, castings, slabs and also big pieces can be easy transported by the use of the walking beams. For the transportation of short pieces (pieces with a length of 140 mm) the widths of the walking beams is just 100 mm. In case a wider furnace room is needed, up to six walking beams can be considered. According to the needs one to six chargings at the same moment are possible.

In case longer parts should be heat treated, the parts will be put on top of several walking beams. In case of round bar material, small grooves are machined into the surface of the walking beams. The walking beams itself and the heating areas in between are made of burned ceramic prefabricated parts. These parts are heat resistant up to 1500 °C.

In order to transport the workpieces through the furnace, the loose beams perform rectangular movements. During the rising up movement the workpieces will be moved vertical. After they have reached the final upper position, they will be moved horizontal. After that the beams drive vertically down and put the workpiece a bit further down again. This step will be repeated until the workpieces reach the outlet of the furnace.

The running time and the movement of the beams can be adjusted and thus different heating times for the workpieces can be reached. As a matter of fact is there no movement of the workpieces on the surfaces of the beams and thus no wear and tear of the beams will appear.

Taking a good isolation in consideration, the bricking up is an very important fact. The thermic efficiency can be increased by use of a good isolation and bricking up. The fire resistant lining has been designed in order to have a max. surface temperature of the furnace of 60°C and a maximum outside furnace ceiling temperature of 80 °C. Even after years of furnace operation the prefabricated isolation parts of the furnace don´t show any signs of wear and tear.



Modern FK Walking Beam Furnace

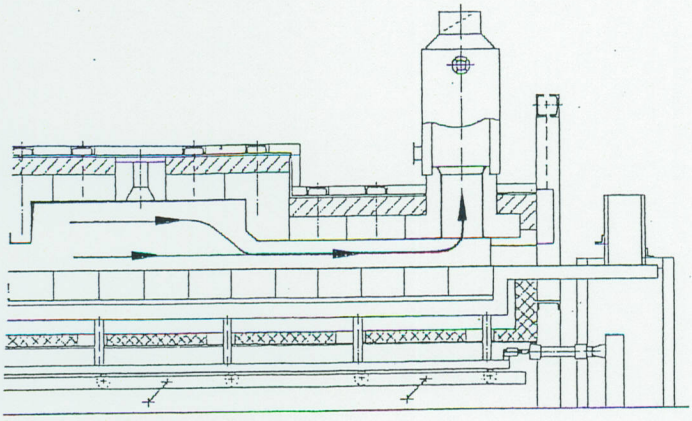
In case the furnace is electrically heated with material temperatures up to 1300 °C, the side walls of the furnace will be build from high temperature resistant special stones. The ceiling of the furnace consists of ceramic fibers. The fibers have been pressed under vacuum to a certain case. Fibrous material formed under pressure and vacuum is very light and has beside a very hard surface. Additional to this has fibrous material all well known advantages as there are – high isolation effect, very good temperature storage and good temperature change stability.

Very important is the dense of the furnace in order to prevent that oxygen from outside will enter the furnace room. The inside furnace pressure has been designed in that way, that exhaust gas will be pressed out through the furnace doors and will be immediately burned.

All Walking Beam Furnaces, designed in the prescribed way, will be delivered ready assembled, isolated and lined. Depending on the size of the furnace, production capacity from 200 up to 5000 kg/h is possible.

FUEL FIRED WALKING BEAM FURNACES FOR SCALE REDUCED HEATING

The fuel heated Walking Beam Furnaces operate in accordance with the counterflow principle. The workpieces are transported against the flow of the exhaust gas. This principle leeds to a very economical heat consumption and reduced scale building on the workpiece surface. The warming up of the material is effected in two zones. In the first zone which covers 75 % of the furnace area, the workpiece will be pre heated up to 800 °C. In the second zone the required final temperature will be reached very fast. If the air figure in the high temperature zone will be adjusted to 0,6, the exhaust gas will build a good protective gas atmosphere. The furnace will be only heated from the furnace ceiling by use of special burners.



As a matter of fact are the burners heating and building up at the same moment a protective gas atmosphere. Due to that special care was taking to this fact. Each burner has an own fuel- and combustion air measurement system. The adjustment of the fuel / air mixture can be done very precise.

At the inlet side the ceiling of the furnace is very low and close to the workpiece. The hot combustion gases are floating over the cold workpieces and produce during this procedure (convection) further heat. When the combustion gases are leaving the furnace the temperature is already below 1000 °C.

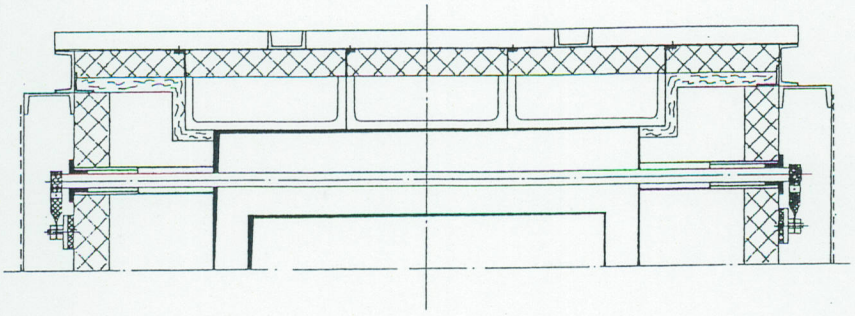
In order to reach additional combustion, the exhaust gas will be guided through a recuperator in order to reach a certain combustion temperature. This pre heating up to 400 °C results in a higher combustion temperature. Inside the recuperator exhaust stud a special throttle flap is installed in order to adjust the right flow pattern. All design matters are carried out in order to reach a high efficiency. With 50% efficiency we could even reach results which are better than efficiency results of common furnaces.

ELECTRIC HEATED WALKING BEAM FURNACES WITH PROTECTIVE GAS ATMOSPHERES

In accordance with nowadays known state of the art, is the temperature in fuel burned furnaces limited to 1100 °C. In case the furnace should be kept under a protective gas atmosphere by use of protective gas, produced outside the furnace, and the temperature should be above 1100 °C, electric heating is the solution. By the use of this procedure even alloy steels can be heat treated without scale building. Steel with addition of Chromium, Manganese or Silicon etc. can't be heat treated scale free in direct heated furnaces, because these elements have a higher affinity to oxygen than pure iron.

The FK Industrieofenbau + Schutzgastechnik GmbH electric heated Walking Beam Furnaces are design wise similar to the fuel heated furnaces. The electric heating elements are made of pure Silicon Carbide. These elements are made as one piece and can be easy fastened along the furnace side in horizontal position.

Silicon Carbide heating elements can be used in furnaces with protective gas atmosphere up to 1300 °C.



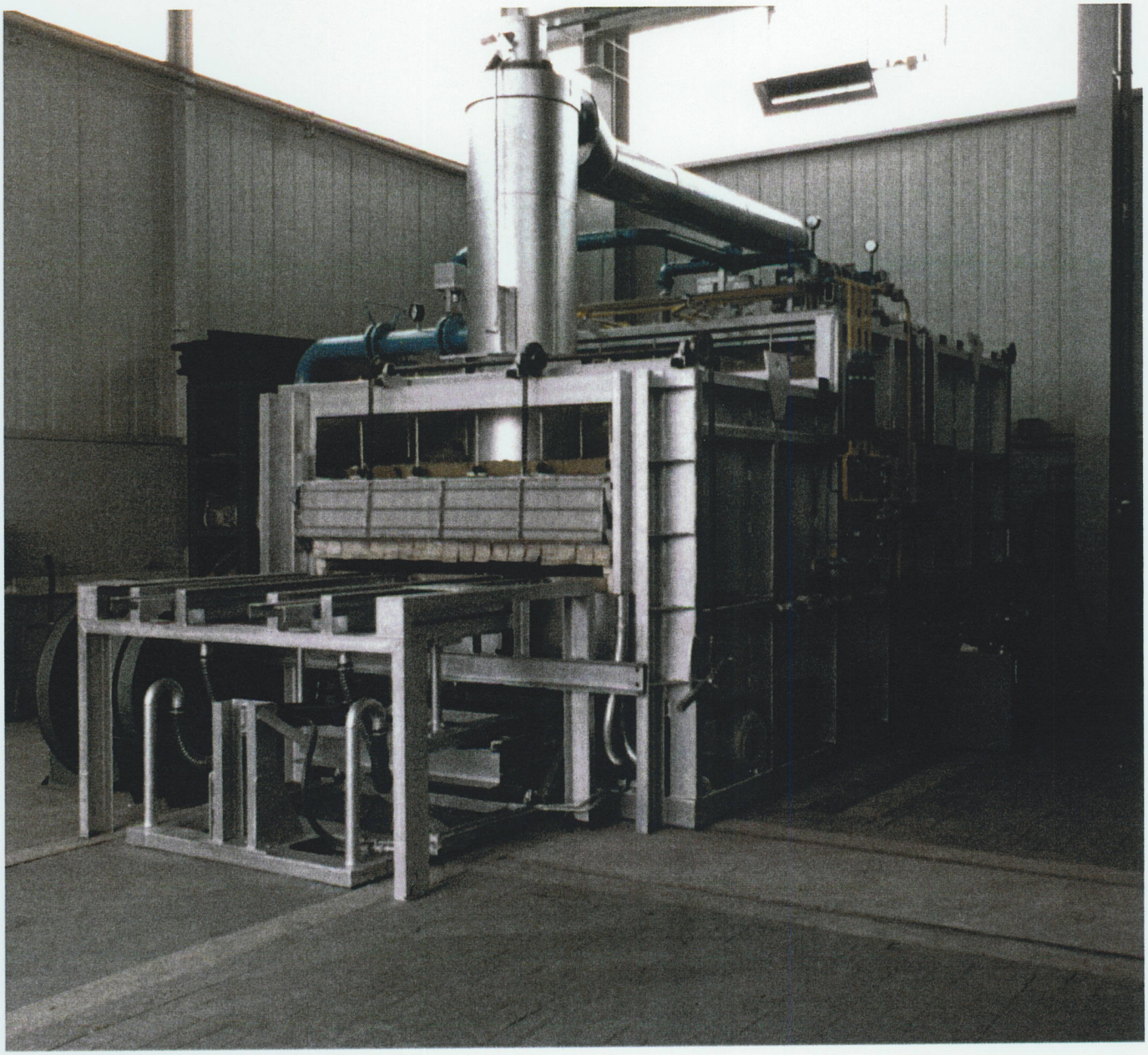
Sectional drawing of a electric heated Walking Beam Furnace

The electric heating has further advantages. The operating and maintenance costs are very low The exchange of the heating elements can even be carried out in case the furnace is still hot. Only the energy supply has to be switched off. Another advantage is the sound level – electric heated furnaces are very quiet during operation. Due to the fact, that electric heated furnaces have no exhaust, heat losses are minor. The furnace efficiency results due to the before mentioned design facts up to 75%.

Another very important advantage using Silicon Carbide heating elements results in the usage of protective gas. Disturbances of the protective gas atmosphere caused by leakages, which are very common by fuel heated furnaces, can be excluded.

With FK Industrieofenbau + Schutzgastechnik GmbH built Walking Beam Furnaces you can reach a very good efficiency. The required protective gas atmosphere will be produced by inert gas generators build by FK Industrieofenbau + Schutzgastechnik GmbH.

Hubbalkenöfen
Walking beam furnaces



Hubbalkenöfen werden eingesetzt zum Erwärmen von Blöcken und Knüppeln in Normal- und Edelstahlqualitäten auf Walztemperatur,
zum Härten, Normalisieren und Nachwärmen von Rundmaterial und Rohren,
für Wärmgutformen, die unabhängig voneinander transportiert werden müssen und für Ofenlängen, die das Stoßen des Einsatzgutes nicht mehr erlauben,
zum Erreichen einer riefenfreien Wärmgutoberfläche.

Von Vorteil ist die Möglichkeit zum Leerfahren des Ofens bei langzeitigen Betriebsstörungen oder Zurückfahren des Wärmgutes aus der heißesten Zone in die Vorwärmzone bei kurzzeitigen Störungen, um ein übermäßiges Verzundern zu vermindern.

Walking beam furnaces are used for heating ingots and billets in standard and fine steel qualities to rolling temperature,
for hardening, normalising and reheating round stock and pipes,
for shaped material which must be separately transported and for furnace lengths which make the pushing of the material impossible,
for achieving a score-free surface and
for running the furnace empty in the event of long lasting breakdowns or for moving the material from the hottest zone into the preheating zone in the event of short breakdowns, to prevent excessive scaling.