

ERF[®]

Electrotherm Refining Furnace



with

ELdFOS[®]

Process for De-phos & De-sulph

Technology

For Dephosphorization and Desuphurization

Dephosphorization up to 105 points (0.105%)

8 ton to 150 ton Capacity



ELECTROTHERM[®]

The Leader in Steel Melt Shop and Foundry Technology

Use of LRF in quality steelmaking

Steel

→ Plain Carbon Steel

→ Low Alloy Steel

→ Medium Alloy Steel

→ High Alloy Steel

→ Stainless Steel

→ Tool Steel

→ Wire Rod

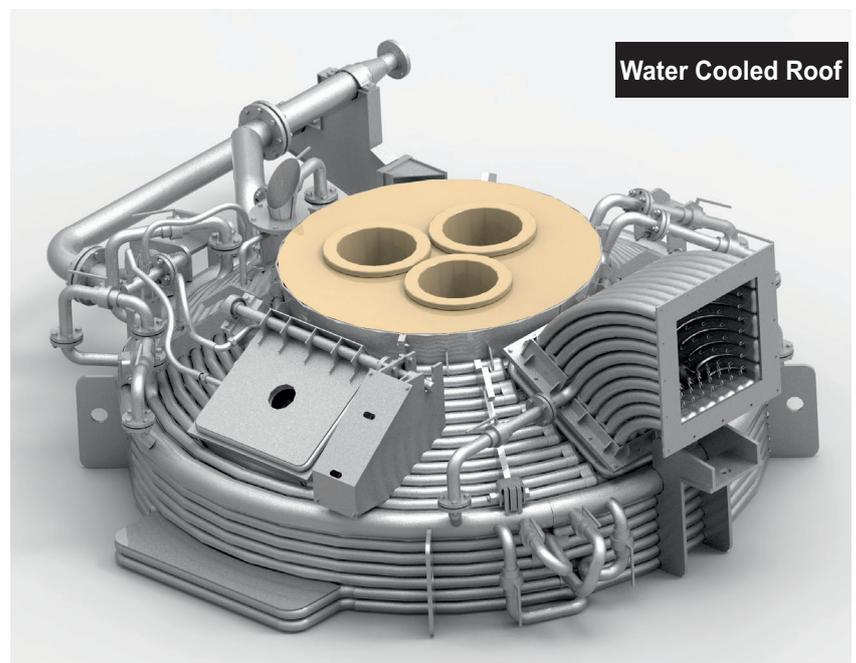
→ LC Fe-Mn

Ladle Refining Furnace (LRF) is mainly used to refine the steel in terms of gas levels, chemistry and inclusion levels. The power is fed to LRF through arc duty transformer. Arcing is carried out through graphite electrodes. Number of transformer taps may vary from 7, 9 or 13 depending on the requirement. Every individual tap has corresponding current and voltage to feed the required power. Main function of LRF are:

- To bring down dissolved gas levels
- To trim the chemistry or to adjust the chemistry as per the required grade
- Desulphurization of steel
- Inclusion floatation
- To act as a buffer between melting and casting units

Electrotherm has developed a special process ELdFOS for dephosphorization of steel using LRF. This process is very effective in the belts where sponge iron is used in the induction furnace for steelmaking in the large quantities. A hydraulic tilting arrangement is provided on the VFD operated ladle car. The slag from the ladle may be removed prior to arcing is required.

During LRF operation current and voltage are monitored continuously using CT and PT. Both of them are kept constant by the principle of impedance balance. At the time of arcing electrodes are lowered to form the arc. As soon as the arc forms, the heating of liquid metal takes place. All the parameters are processed through PLC-SCADA system. The hydraulically operated proportional valves are of very high accuracy and help smooth electrode arcing. The specially designed arcing software avoids overloading of the transformer and required power is fed to the liquid metal for heating.

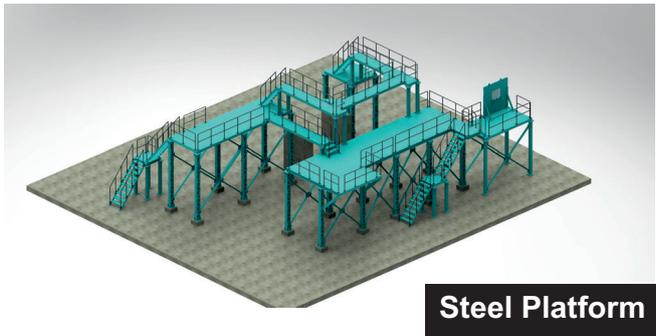


Various electrical protection systems attached to LRF are as follows:

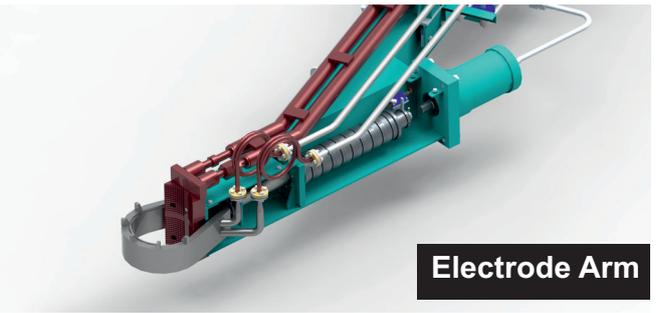
- LRF is equipped with PLC. The over current during arcing is sensed by the controller and it helps raise electrodes which avoids over loading of the transformer.
- In case of control systems exceed the required parameters or fails, the controller switches off the breaker and avoids excessive high current.
- Each and every high current line is kept cool by water circulation. In any electrical circuit the best way to observe any abnormality is increase in temperature. The temperature in water cooled power cable, roof and arms are continuously monitored. The excessive temperature indicates water temperature fault.
- Roof movement, electrode upper and lower positions, trolley positions etc all are monitored with limit switches. e.g. 1) If the roof is down, trolley cannot be moved. The operation is controlled by limit switch. 2) If upper limit of electrode is not cut, the trolley cannot be moved. 3) if home position limit is not cut, arc on operation cannot be started etc.



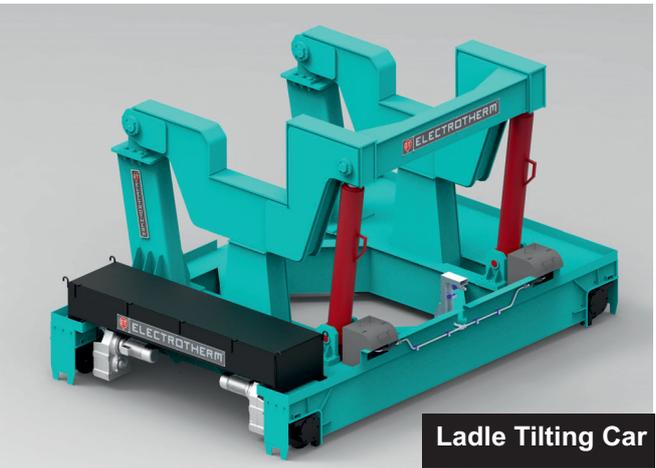
Gas Purging Station



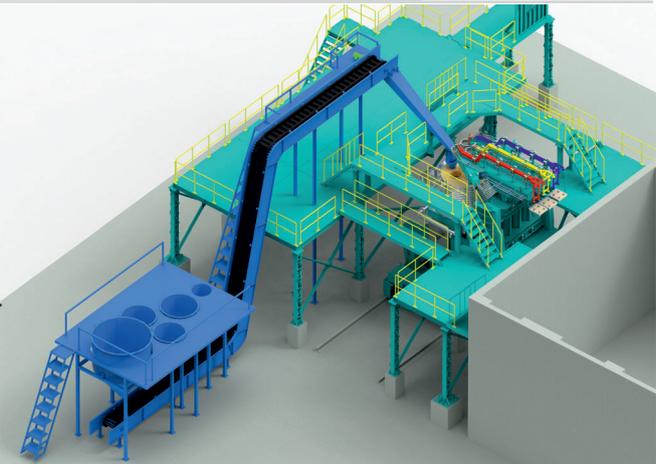
Steel Platform



Electrode Arm



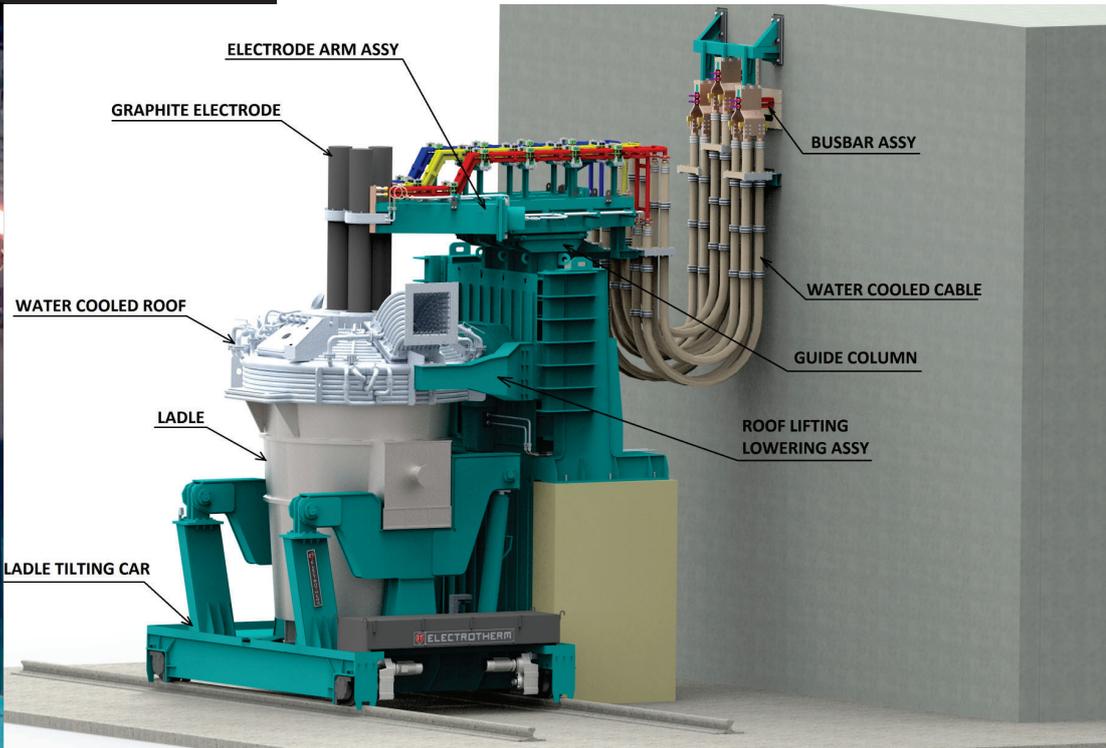
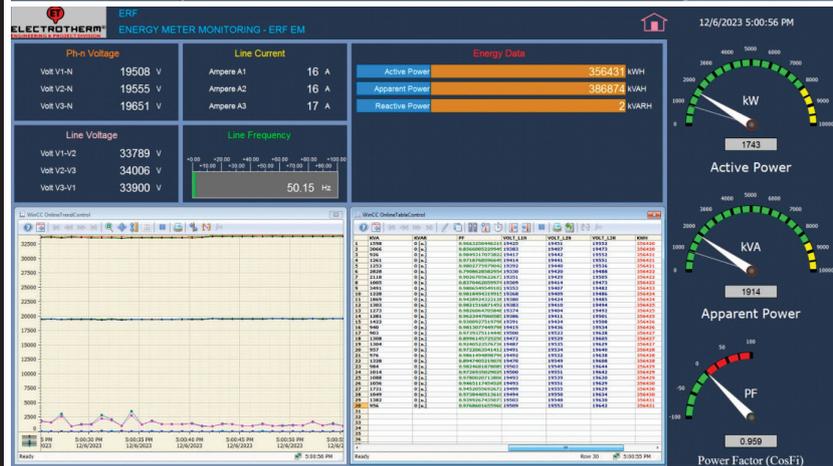
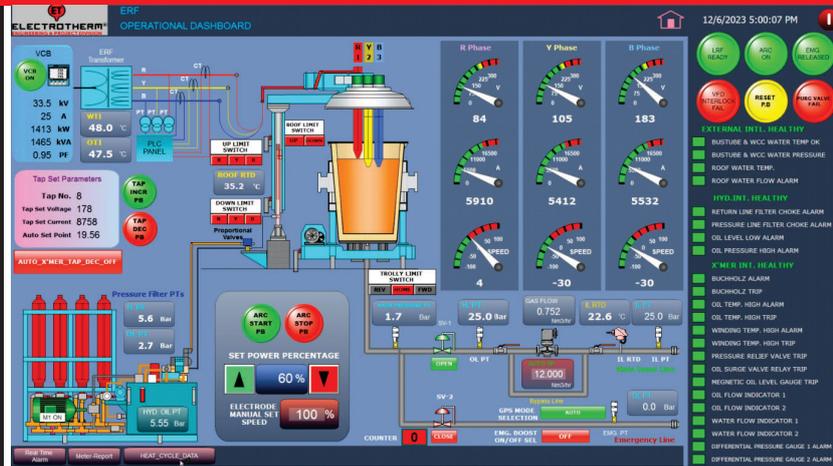
Ladle Tilting Car



- Sometimes hard slag shoots up the current, which may damage the electrode. The fault can be identified by over current.
- Without indication of VCB on, arcing cannot be started.

With all these automation features, smooth LRF operation of achieved. The Operation is suitable for the processing of construction grade steel, alloy steel, tool steel, high speed steel, spring steel, die steel, etc.

Argon purging system is another vary important feature. Precise purging is obtained through Gas Purging System equipped with solenoid valve, mass flow meter, pressure gauge, RTD and PT. Additional emergency high pressure line is provided to avoid the jamming of liquid metal around porous plug. Effective purging is carried out as per the metal requirement with violent, silent and gentle heading. HMI and SCADA screen make the operation user friendly.



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