Metallurgical Injection Technology
For the production of high-grade steels, hot metal desulphurisation is absolutely essential. Desulphurisation plants from ThyssenKrupp Polysius reliably and precisely reduce the sulphur content of the hot metal. The treatment process can take place in transfer ladles or torpedo ladles.

On the secondary metallurgy sector, ThyssenKrupp Polysius supplies injection systems for steel treatment in transfer ladles.

Depending on the objective of the steel treatment, different agents or combinations of agents can be injected into the molten steel.

For the utilisation of residues in steel works, ThyssenKrupp Polysius offers injection plants for conditioning converter slags and for recycling filter dust from the electric arc furnace.

Having built more than 150 such plants all around the world, ThyssenKrupp Polysius possesses comprehensive and well-founded system- and process-technological know-how.
In modern integrated metallurgical plants producing high grade steels, the hot metal desulphurisation takes place outside the blast furnace. The desulphurisation process precedes the steel treatment in the converter.

For this external hot metal desulphurisation, the dip-lance method has established itself as the most reliable and cost-effective process.

For this reason, most steel works selectively reduce the hot metal’s sulphur content in charging and transfer ladles using the dip-lance method.

ThyssenKrupp Polysius has developed injection technology for this process for more than 35 years now.

Starting with the desulphurisation of hot metal in torpedo ladles, this proceeded through the injection of calcium carbide to the latest method of Multi-Injection, using lime, calcium carbide and magnesium and applying state-of-the-art instrumentation and control.

What makes the dip-lance method so effective for hot metal desulphurisation is the precisely dosed pneumatic injection of powdery desulphurisation reagents into the molten metal via refractory lances.

This achieves intimate mixing of the hot metal with the desulphurisation reagents. The dip-lance method can reliably reduce the sulphur content of the hot metal to figures as low as 0.001 percent (10 ppm).

ThyssenKrupp Polysius developed a mathematical model for hot metal desulphurisation, which – combined with state-of-the-art plant technology – assures high plant availability and highest possible throughput rates.

The use of effective desulphurisation reagents such as lime, calcium carbide and magnesium, minimises the amount of slag while simultaneously cutting the process time and greatly reducing the hot metal losses during deslagging.
To assure operating cost minimisation, the combination of dip-lance method with mathematical process model and flexible plant control offers a range of possible process technological variations.

One of these possibilities is to vary the injection rate (kg/min) to suit the production conditions. This must take account of the fact that the effectiveness of hot metal desulphurisation is inversely proportional to the desulphurisation reagent injection rate. In accordance with the length of time available for the treatment process and under consideration of all further parameters, the system then selects the most cost effective process.

Another possibility is to inject different desulphurisation reagents during one hot metal treatment session. The desulphurisation reagents can be injected singly, simultaneously or with a time lag. These process options are called Mono-Injection, Co-Injection and Multi-Injection.

Which of the above processes achieves the lowest operating costs is determined by the operating and production conditions, which can vary from batch to batch. Among the important factors taken into account by the mathematical model devised by ThyssenKrupp Polysius are the weight, temperature and analysis of the hot metal, the target sulphur content, the properties of the blast furnace slag and the available injection time.

To be able to select the optimum process at any time and thus flexibly adapt the hot metal desulphurisation plant to the respective operating and production conditions, a comprehensive knowledge of the metallurgy of the hot metal desulphurisation process is required.

Selection of the optimum process is performed by a metallurgical process computer. The effectiveness of the process is therefore decisively determined by the “programmed process knowhow”.

Due to the large number of plants already supplied, ThyssenKrupp Polysius possesses comprehensive knowledge. This is implemented in the metallurgical process computer that our company developed, and thus benefits our numerous clients all around the world. The metallurgical sequence program contains mathematical equations which reflect the regularities of hot metal desulphurisation, so that every individual hot metal batch is desulphurised with the optimum process.
ThyssenKrupp Polysius provides metallurgical plant technology that is tailored to the individual range of products and the general operating conditions of the steel works.

All plant components come from a single source, starting with the unloading station for bulk transporter vehicles or tank wagons, through storage silos for the desulphurisation reagents, the pneumatic dispensers, the injection lance insertion unit, automatic lance changing equipment, temperature measurement and sampling devices, slag skimming machines and onward to the electrical control systems, control panels and electrical equipment and the metallurgical process computer.

Custom-tailored treatment stations with ladle transfer car or hood carriage round off the range of products.

ThyssenKrupp Polysius also performs the extension, modernisation and optimisation of existing plants.

Our comprehensive scope of services also includes field assembly, commissioning and plant and process inspections at existing plants.
From the detail to the complete solution
Everything from a single source