

APPLICATION NOTE

FLIR GF346 Gas Detection Camera Used at Tata Steel Ltd. to Detect Carbon Monoxide Gas

Indian multinational steel-making company, Tata Steel Limited, is one of the largest steel producers in the world. With an annual crude steel capacity of 23.88 million tonnes, Tata Steel has manufacturing operations in 26 countries and employs about 80,500 people. The company's largest plant, located in Jamshedpur, Jharkhand, is a 10 MTPA crude steel production facility that produces hot and cold rolled coils, sheets, galvanized sheets, tubes, wire rods, construction rebars, and bearings.

PROTECTING WORKERS AND CONSERVING CARBON MONOXIDE WITH OPTICAL GAS IMAGING

Ensuring environment and worker safety in all production units is a top priority for Tata Steel. The plant uses blast furnace, coke oven, and Linz-Donawitz (LD) gases in the production process. The primary component of these gases is carbon monoxide, so leakage is not only harmful to the environment but can be life-threatening to workers. In addition, these gases are reused for power generation and reheating furnaces, so leaks cost the company a substantial amount in both money and energy conservation.

Identifying a gas leak source can be difficult, not only because these gases are invisible to

the naked eye. The effect of leaks is often very gradual and can be masked by changes in airflow, making fugitive gases difficult to detect with more traditional methods. In an effort to find a better solution, Tata Steel researched and eventually purchased a FLIR GF346 optical gas imaging (OGI) camera.



LD#2 caster- leakage through tundish heating line blanking joint.



The FLIR GF346 optical gas imaging camera visualizes CO and 17 additional gases.

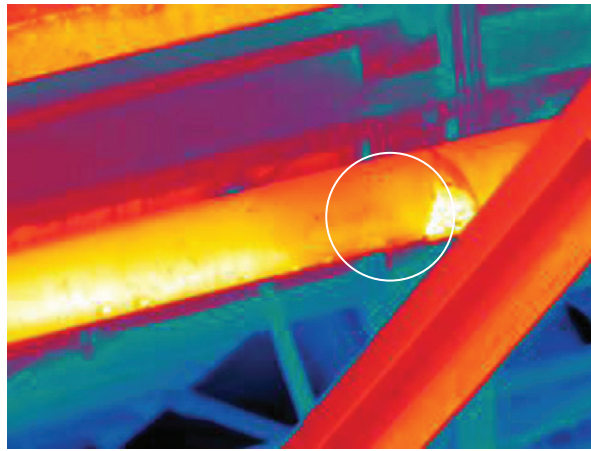
The FLIR GF346 uses a specially filtered thermal detector to visualize carbon monoxide (CO) and other harmful gases. The camera can be used to quickly scan for gas across wide areas and from a safe distance, without the need to interrupt a plant's production process. As CO emissions can be a significant threat to steel manufacturing operations, emissions need to be closely watched. Even the slightest leak in a vent stack or pipe can have a devastating effect. The FLIR GF346 can scan potential leak points rapidly, and allow the user to pinpoint their source in real time.

One of the first uses for the company's GF346 was to find an elusive leak near the Caster #2 casting floor. Amitabha Guha, Senior Manager (inspections) at Tata Steel, said his crew was unable to detect the CO gas leak source in the casting floor area. The leak began in the late evening hours, so a lack of sunlight and the frequent change in natural air flow direction made it difficult to trace out the source of leakage.

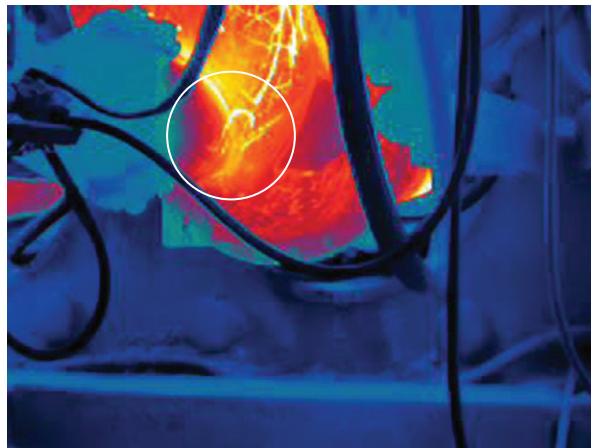
With the help of the GF346 thermal imaging camera, inspectors scanned all possible sources of the leakage point near gas pipe lines. They found no gas leak in the region around the steel-making unit (LD2&SC), so they decided to scan the gas lines outside the LD2 premises. The crew finally detected the source of the leak in a Fuel Management Department main CO line, which is 60 meters away from the casting floor. Gas was escaping from a flange joint in a line that supplies gas to the hot strip mill (HSM) reheating furnace from the gas mixing station. Inspectors closed off and secured the area, then communicated their findings HSM & FMD for immediate corrective action. Repairs began immediately, preventing an unsafe incident and closing off the source of the leak.

BLAST FURNACE INSPECTION

Tata Steel used the FLIR GF346 to inspect all of its blast furnaces, which produce liquid iron for steel making. Blast furnaces have tuyers for supplying hot blast to the furnace burden that are fitted to the furnace shell. Frequent leakage of CO gas from these tuyers creates an unsafe and unhealthy atmosphere at the tuyer platform and above. Inspectors used the GF346 to scan all 34 tuyers and identified the leaky tuyers from a safe distance. As before, Tata Steel took immediate corrective action and updated the tuyers with a new welded design. After changing the tuyers, they scanned with the GF346 again and found that the leaks were eliminated. As a result, operating personnel are now working in a gas-free environment. Inspectors ensuring they had proper Delta T – or temperature difference between the target and the background scene – to achieve the optimal image contrast needed to detect the lowest level of gas emissions using the GF346's high sensitivity mode.



PH #4 leakage through BLR flame support line



HBF tuyer #6



HBF tuyer #7

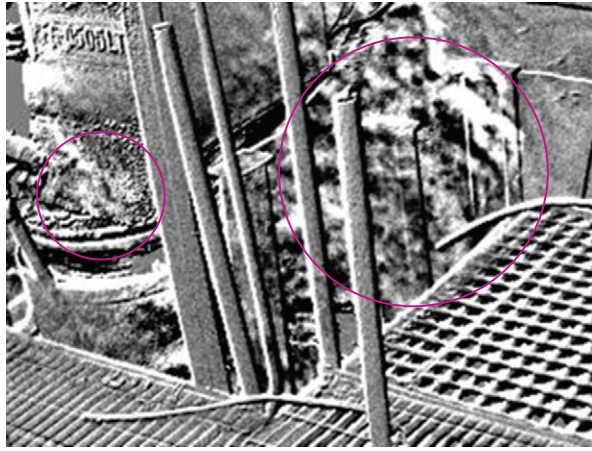


HBF leakage through GV #1

HOT STRIP MILL INSPECTION

The Tata Steel hot strip mill (HSM) produces hot-rolled sheets for automobile and LPG grades. The mill is fed by three reheating furnaces which use carbon monoxide-rich blast furnace gas and coke oven gas as fuel. Leakage of unburnt CO was identified through the camera, and inspectors quickly and safely found the source of the leak at three locations in the pipe joints. HSM took immediate corrective action to eliminate the presence of CO near the furnace.

The FLIR GF346 OGI camera has served as an extremely important tool for Tata Steel, helping inspection crews identify problems before they become catastrophic, and conduct surveys without shutting down operations. The GF346 is ideal for monitoring plants where it is difficult to reach components with contact measurement tools such as gas sniffers. Inspectors can scan literally thousands of components per shift without the need to interrupt the process. Optical gas imaging also allows operators to detect profuse leaks and find their source while working from a safe distance, outside the gas cloud. Tata Steel found that, through these advantages, the FLIR GF346 improved work safety, reduced environmental impact, and helped them maintain regulatory compliance. Tata Steel has achieved zero gas leakage incidents in the past year.



HSM FCE area leakage, seen in high sensitivity mode.



HSM pipe leakage at FCE #1

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