

# ArcelorMittal Dunkerque Performs Evaluation of Thermo Scientific ARL iSpark OES Spectrometer

## for their Low Alloy Steel Analyses

### ARL iSpark™ 8860 benefits

- Unique PMT optics
- Revolutionary digital spark generator
- Innovative spark stand design
- Advanced acquisition technologies and processing algorithms for PMT signals
- Best performance for trace analysis
- Single and multi-matrix configurations
- Smart argon management with argon saving modes
- Most advanced analysis of micro-inclusions
- Instrument of choice for metal producers and refiners

“This evaluation was very successful, especially in a routine mode. Analytical results for PMT and CCD detectors were satisfying all our criteria.

The ARL iSpark spectrometer will be an excellent investment for my company, in particular in a fully automated version for my routine steelmaking laboratory.”



ARL iSpark OES Spectrometer



ArcelorMittal plant in Dunkerque, France

With 130 million tonnes of annual production capacity (around 10% of the world capacity of steel production) and 245,000 employees across 60 countries, ArcelorMittal is the world's leading steel and mining company.

The company's portfolio of products includes finished, semi-finished, long and flat products, such as slabs, hot-rolled coil, cold-rolled coil, coated steel products, tinplate and heavy plate, as well as billets, blooms, rebars, wire rod, sections, rails, sheet piles and drawn wire.

Its products are sold to the steel-consuming industries including automotive, heavy machinery, pipes and tubes, construction, packaging and appliances.

It operates through numerous subsidiaries in the United States, Canada, Brazil, France, Germany, Kazakhstan, Ukraine, South Africa, among others.

The plant ArcelorMittal Dunkerque is a production of strategic importance within the industrial network of ArcelorMittal in Europe. With a workforce of over 3300 people, it has a production capacity of 7 million tonnes.

This steel-making plant specializes in flat carbon steels and owns three blast furnaces (BF2, BF3 and BF4), the BF4 being one of the best performing blast furnaces in Europe.

The site also includes two coke plants, two sinter chains, one steel shop with three converters, four continuous casting line slabs, one hot-rolling mill and one cold-rolling mill.

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Jean-Claude Lopez, General Manager of ArcelorMittal Atlantique and Lorraine Laboratories (analysis, testing and metallographic)

### Performance tests

Mr. Jean-Claude Lopez, General Manager of ArcelorMittal Atlantique and Lorraine Laboratories (analysis, testing and metallographic), explains: "We have been using the Thermo Scientific ARL iSpark OES spectrometer for 4 months (October 2012 – January 2013) as part of an official Cooperation Agreement between ArcelorMittal and Thermo Fisher Scientific. The purpose of the agreement was for us the evaluation of the instrument in industrial laboratory conditions and for Thermo Fisher Scientific the validation of the suitability of the instrument for demanding steel making plants."

During this period, Mr. Lopez and his team tested the capability of PMT and CCD detectors for analysis in their low alloy steel matrix.

In a first step, they compared the detection limits, accuracy, repeatability and reproducibility against their two fully automated Thermo Scientific ARL 4460 spectrometers, a standard initial test procedure for the implementation of new equipment in their laboratory. Mr. Lopez confirms: "The results matched perfectly our acceptance criteria for low element concentrations, in particular for the critical elements C, N, P and S measured with PMT detectors. Our tests demonstrated the suitability of the CCD detector for the determination of the elements at concentrations above trace level."

The completely new design of the analytical spark stand proved to be extremely beneficial for the results obtained for the above mentioned VUV trace elements (C, N, P and S).

### Evaluation in routine analysis

In a second step, Mr. Lopez used the ARL iSpark spectrometer for analysis by shift technicians in production, in order to compare the system with their ARL 4460 systems and evaluate the ARL iSpark for routine analysis. During 3 months about 1'500 samples were measured, which means that 3'500 sparks were performed on production steelmaking samples.

The main conclusions reported by the shift technicians were:

- Ease of use and robustness of the system
- Easy maintenance operations
- Convivial analytical software OXSAS
- Reduction of cleaning frequency without degradation of analytical results
- Reduced argon consumption

### Inclusion analysis

Finally Mr. Lopez and his team also tested inclusion analysis Spark-DAT methods. The benefit of the methods for ultra fast and simple assessments of inclusion populations was demonstrated. The Spark-DAT method to determine quantitatively inclusion size distributions was validated by SEM and the one to quantify oxygen – based on inclusion analysis results – at lowest levels (30 ppm and below) in calcium treated steels produced really pertinent results.

### Conclusion

Mr. Lopez concludes: "This evaluation was very successful, especially in a routine mode. Analytical results for PMT and CCD detectors were satisfying all our criteria. No doubt, the ARL iSpark spectrometer will be an excellent investment for my company, in particular in a fully automated version for my routine steelmaking laboratory."



Olivier Nicco, Technician at ArcelorMittal Dunkerque, operating the ARL iSpark metals analyzer



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