

**„MONITORING INCOMING SCRAP
FOR RADIOACTIVITY IN MITTAL STEEL ZENICA“**

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ABSTRACT

Steel companies are confronted each day by the possible presence of radioactive materials in steel scrap. Many steel plants have already been equipped with radiation detectors, often installed at the entrance point for the scrap. Mittal Steel Zenica - steel producer will concentrate its efforts on improving radiation detection. The large scrap of Mittal Steel factory also uses radiation detectors to check loads of incoming scrap for signs of radioactivity. Results should allow elimination of the risk of emitting harmful radiation in the workplace or into the environment.

Keywords: radioactivity, contamination, steel scrap, detection

1. INTRODUCTION

Iron and steel scrap are vital raw materials for the production of new steel and cast-iron products. The steel industry has been recycling steel scrap for more than 150 years [1]. In 2005, electric-arc furnace steel made from recycled ferrous scrap was about 38% of the total raw steel produced in Europe EU 25 [2].

Steel is an essential component of millions of industrial, business and consumer products. The presence of radioactive contamination in steel scrap resulting from the production, utilization and fabrication of nuclear fuel poses a risk to public safety, threatens the metals recycling stream, and can cause millions of Euros worth of damage to facilities that unknowingly process contaminated metals.

2. MONITORING FOR RADIOACTIVITY IN IMPORTED STEEL SCRAP

European steel scrap specification give general conditions applicable for all grades [3]. All grades shall exclude:

- material presenting radioactivity in excess of the ambient level of radioactivity
- radioactivity material in sealed container even if no significant exterior radioactivity is detectable due to shielding or due to the position of the sealed source in the scrap delivery.

The term «radioactively contaminated» means any material containing residual levels of radiological contamination involving any source material, by-product material, or special nuclear material.

There is concern that imported steel scrap may contain radioactive sources or materials. If undetected, these sources could become mixed with other steel scrap that is being refined for steel production. The contaminated metal can enter into the steel-processing cycle and potentially be incorporated into consumer products. Regarding with that contaminated steel scrap can have major health, environmental and economic impacts.

3. MONITORING IN MITTAL STEEL ZENICA

The steelwork “Mittal Steel Zenica” currently produces 520,000 tons of steel in 100-tons electric-arc furnace, using different kinds of steel scrap like remote obsolete plant and structures, etc. The approximate 500,000 to 600,000 tons of steel scrap will be recycled in Zenica steelwork during 2006 made up of a variety of long products, including forgings, bar and rod. The bulk of scrap that is recycled is generated in mainland eastern states like as Romania, Serbia and Montenegro, Poland, upon this Algeria etc.

In addition to the exposure risks radiation detection systems in Mittal Steel Zenica offer the opportunity to monitor bulk scrap from wagons and trucks directly during the incoming in the steel factory as well as during off-loading process at the steel factory and has three radiation detectors for the monitoring of steel scrap from arrival at the factory:

- at arrival station of incoming steel scrap in wagons
- at arrival station of incoming steel scrap in tracks
- during off-loading process in scrap yard.

Figure 1 shows monitoring of incoming steel scrap by wagon transport in Mittal Steel Zenica.



Figure 1: Monitoring of incoming steel scrap in wagon transport in Mittal Steel Zenica

The vehicle monitoring system which is used in Mittal Steel Zenica in its scrap recycling process works automatically, checking every load that goes in the steelwork. When it finds something that might cause the load to be rejected, the alarm sounds.

The measuring system is equipped with three sensors. The sensors detect objects such as transportation units in the measurement area. Detector provides vertical coverage of the vehicle. The monitor is installed in a security scale house and offers clear and concise display of system conditions. This unit includes an alphanumeric display for viewing operator instructions and messages, an audible alarm as well as a single red alarm annunciator and green, System Status light. This system helps to keep radioactive materials where they belong - out of the facility.

The Mittal Steel Zenica also defined a protocol for the monitoring of steel scrap and has procedures in place to detect radioactive material. The protocol also specified the characteristics of the instruments to be used at all stage of the control process of steel scrap.

The protocol required:

- radiation measurements outside each wagon and track with fixed detection systems positioned at the entrance gate or with portable detectors;
- radiation measurements and visual inspection of the metal scrap after unloading.

4. ELECTRONICS FHT 8000

For measurement and evaluation an electronics FHT 8000 is used. It comprises all boards to supply the detectors, count the detector signals and to calculate the measured values. The operation is fully automatic not necessitating any further user intervention. All evaluation routines are stored as software modules and include control routines for the operational modes [4]:

- data acquisition and evaluation system with embedded PC-compatible computer
- external monitor
- protocol printer
- operating system MS-WINDOWS
- hard disk
- basic version with 20 counter channels
- software based configuration of measuring modules.

FHT 8000 control unit based on industrial PC in Mittal Steel Zenica factory is presented in Figure 2.



Figure 2: FHT 8000 control unit with monitor

The FHT 8000 includes all programme modules and functionalities (Measuring Channel FHT 8000 – Software) for the fully automatic operation of the sample changer [5]:

- start-up routines (setting of parameters)
- data acquisition and evaluation routines
- protocol generator for measurement results; data storage
- control of sample changer mechanics
- control of failrates and alarm levels
- plateau measurement
- background and calibration measurement
- automatic restart after power fail.

5. CONCLUSION

Steel is one of the world's most recycled products. Steel scrap is a necessary component in the production of new steel. Radiation detection systems are today installed at scrap-processing facilities in efforts to detect the presence of radioactive material and prevent an accidental melting. Detection systems in Mittal Steel Zenica offer the opportunity to monitor bulk scrap from wagons and trucks directly during the incoming in the steel factory as well as during off-loading process at the steel yard. The configuration and orientation of the detection system in Mittal Steel Zenica increases the probability of detecting a source of contamination of steel scrap.

6. REFERENCES

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