SODERN CNA–NICKEL

Real-time quality control for the nickel ore mining industry

The Sodern CNA-Nickel is the fourth generation of the world’s most advanced online elemental analyzer, based on the PFTNA (Pulsed Fast and Thermal Neutron Activation) technology. Nickel mining and extraction operations will benefit from control of quality and moisture of the ore before shipping to and arrival at the treatment plant, enabling sorting of material on nickel content and optimizing the homogenization of the stockpile.

When integrated into the pyrometallurgical extraction process, the Sodern CNA-Nickel is an essential tool to control the nickel grade (the Fe/Ni ratio) and the basicity index (MgO/SiO₂) of the material entering the kiln. As such, extraction process requires removal of all free moisture and combined water. Controlling the moisture also allows for significant energy savings. Similarly, online elemental analysis can also be beneficial for the hydrometallurgical process, which in turn is seen to be the future for the treatment of lower grade nickel laterite.

Advantages of Sodern CNA-Nickel

Unique and proven PFTNA technology – for the management of nickel ore mining and extraction operations and control and optimization of the concentration process

Unmatched nickel grade measurement – thanks to the low signal to noise ratio and the high metallic element detection capability

Uptime
- Unmatched analytical stability delivered by constant neutron flux from generator eliminates expensive and inconvenient periodic on-site calibration
- Modular design minimizes downtime during installation

Ultimate safety – Unlike radioactive isotope-based units which always emit neutrons, the Sodern CNA’s tube type neutron source can be switched off during non-operation, routine maintenance or emergency and enables installation of a unique Automated Radiation Protection System (ARPS).

Global support and expertise
Addressing the needs of the nickel ore mining and concentration operations

Benefits of a cross-belt analyzer in your process

Mining
Installation of a Sodern CNA in the mining operation (before and/or after shipment to the treatment plant) enables control of the nickel grade and moisture which allows for sorting and optimizing the stockpile and shipment, delivering value to both sender and receiver.

Extraction
A Sodern CNA installed after dryer operation enables control of the nickel grade, the Fe/Ni ratio and the basicity index (MgO/SiO2) of the material entering calciners. It is possible to adjust silica, iron or carbon additives to prevent corrosion of the furnace lining. By determining the moisture content, the Sodern CNA-Nickel allows for optimization of the dryer parameters in the pyrometallurgical process resulting in significant energy savings during the calcine process.

Nickel, from sulfide nickel ores, is extracted by a process where the nickel sulfide mineral is freed from gangue by crushing and grinding, after which it is separated by flotation and finally smelted or roasted. Extraction of nickel from the laterite ores is carried out either by pyrometallurgical (for saprolite) or hydrometallurgical (for limonite) process.

PAAnalytical and Sodern have extensive experience in the analysis of lateritic nickel ores in New Caledonia and more precisely of silicate (or saprolite) type of lateritic nickel ores. However, the Sodern CNA-Nickel can be used for sulfide nickel ores as well.

Cost-saving opportunities
- Value optimization at nickel ore mining operation
- Energy savings by moisture control
- Prevention of corrosion damage to the kiln
- Manpower and maintenance savings by removal of the sampling tower

Unique and proven PFTNA principle

Using high energy neutrons to determine the chemistry of materials is very useful for process control because the analysis is done instantaneously, allowing many control changes over short periods of time to achieve the target chemistry. The analysis is very representative since all the material on a belt from top-to-bottom and side-to-side is being analyzed.

Pulsed Fast Thermal Neutron Activation (PFTNA) analysis involves ‘illuminating’ the raw material with neutrons. By measuring the energy of each gamma ray induced by the interaction of neutron and nucleus of atoms, most elements contained in the raw material (such as silica, calcium, alumina and iron) are identified and quantified.

The primary analytical advantage of PFTNA over traditional Prompt Gamma Neutron Activation Analysis (PGNAA) is the ability to pulse the neutrons used to excite the sample. Pulsed excitation produces a much higher quality time-resolved gamma ray spectrum from the sample with a drastically improved signal to noise ratio. This higher quality data results in a more accurate and robust analysis.
**Uptime**

**Stability**
The Sodern CNA’s comprehensive factory calibration is guaranteed to be drift-free. The rate of neutron generation is fully controlled and never changes over the lifetime of the tube, thus the same level of analytical performance is maintained. This stability eliminates the need for the laborious and expensive routine recalibrations that are required with radioactive isotope-based systems.

**Modular design**
The Sodern CNA’s modular design makes it easy to install and service, guaranteeing that downtime is kept to an absolute minimum.

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**Safety**

In addition, the electric neutron source does not present the kind of hazardous waste issues that are unavoidable with radioactive isotope-based analyzers.

The lifetime of this source can exceed 14,000 working hours, making it the longest lifetime tube of any commercially available neutron tube. The Sodern sealed neutron tube has evolved from 40 years of experience in designing and manufacturing neutron generation products. Only Sodern EADS is the world’s leading supplier of neutron tubes for a vast assortment of industrial, defense and security applications worldwide.

Improving safety by using an electrical source is a major benefit of PANalytical’s analyzers. As a small particle accelerator made by Sodern EADS, the pulsed neutron generator is an ON/OFF electric neutron source and the basis of PFTNA analysis.

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**Analytical results**

**Sodern CNA-Nickel moisture results compared to laboratory values show a very good correspondence.**
Global and near

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Other applications

PANalytical also offers PFTNA cross-belt based applications for raw material characterization, quarry/mine management, raw material sorting/blending, and stockpile pre-homogenization and modelization for:
- Iron ore
- Copper ore and concentrate
- Coal

Global support and expertise

A powerful built-in diagnostics program links the CNA to PANalytical customer support service. Thanks to a modem or an Internet connection, remote system diagnostics and maintenance are facilitated, ensuring optimum operation and uptime of the CNA. In addition, dedicated and reactive high-skilled engineers are internationally present, allowing assistance around the clock everyday.

Specifications

**Analysis**
- **Methods**: Pulsed fast & thermal neutron activation analysis
- **Generator**: Electrical neutron generator (On/Off)
- **Quantified elements**: For laterite ores: Ni, Co, Fe, Mg, Si, Al, Mn, Cr, C, H, O
  For sulfide ores: on request
- **Nickel parameters**: For laterite ores: Ni, Fe₂O₃, MgO, SiO₂, Al₂O₃, Mn, Cr₂O₃ and CaO
  Nickel grade (the Fe/Ni ratio) and the basicity index (MgO/SiO₂) and moisture
  For sulfide ores: on request
- **Features**: Unaffected by varying belt loading

**Environment**
- **Temperature**: From -35˚C (-31˚F) to 40˚C (105˚F) (extended temperature range is optional)
- **Humidity**: 1-100%

**Operational**
- **Conveyor width**: 800 to 1400 mm
- **Bed depth**: 100 to 280 mm
- **Belt speed**: Up to 4 m/s, faster speed upon request
- **Belt inclination**: Up to 20˚
- **Particle size**: Maximal 90 mm
- **Belt load**: 50 to 150 kg/m

**Installation**
- **Standard version**: W = 2 m, L = 1.1 m and H = 1.8 m
  Weight = about 2.9 T
- **Extended shielding**: W = 2.2 m, L = 1.3 m and H = 2.1 m
  Weight = about 5.3 T

**Electronics**
- **Electrical cabinet**: H = 800 mm, W = 600 mm, D = 400 mm
- **Power requirement**: Single phase 230 V, 47 to 63 Hz, less than 2 kW
- **Dry contact inputs**: Belt status, safety loop
- **4 - 20 mA inputs**: Weight feeder, speed feeder

**User interface**
- **CNA control software**: CNA data collector, trending application and basic pile building function
- **System interface**: OPC (industry standard for communication) Other interfaces upon request

**Communication**
- **Serial**: Ethernet or fiber optic
  Suitable interface with many plant control networks
- **Off-site communication**: Data quality phone link or internet link

**Safety**
- **Safety loop**: ARP System (Automatic Radiation Protections System)
- **Radiation levels**: Compliant with European council directive 96/29/ EURATOM
  No radiation when the CNA is not in operation

**Maintenance**
- **Customer support**: PANalytical customer support service with PANassist. Wide range of maintenance contracts upon request

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