



MIRS

**ROBOTIC CONCENTRATE SAMPLER
TRUCKS**



MIRS is a leader in robotic solutions for the mining and heavy industrial sectors. We have many years' experience in providing conceptual development, design engineering, manufacturing, integration and support services for our world-class robotic solutions.

We have developed numerous robotic solutions in harsh industrial environments, including mines, concentrators, tank houses, smelters, refineries, and foundries. Our mission is to exceed our customer's expectations, encourage the professional development of our people, and promote sustainability.

MIRS solutions incorporate state-of-the-art robotics and provide numerous benefits, including:



PRODUCTION COST REDUCTION



RELIABILITY INCREASE



HEALTH AND SAFETY IMPROVEMENT



QUALITY CONTROL INCREASE



MIRS understands the fundamentals of concentrate sampling, the importance of accuracy and reliability for transactions between producers and their customers, and the impact of variables such as humidity and concentrate grade on metal accounting. Improperly collected samples that are not representative of the bulk concentrate can lead to improper valuation of a material. It is therefore critical to follow proper sampling practices to collect a sample that accurately represents the concentrate.

MIRS has developed an innovative robotic concentrate sampling system that safely and reliably collects representative samples by minimizing human interaction and eliminating sampling error. The system has been designed for sampling bulk concentrates in harsh environments from trucks, maxibags, and trains. The high precision of robotic technology and **MIRS'** high-quality design and engineering standards, make the robotic concentrate sampling system the most advanced concentrate sampling system in the mining and heavy industry markets.



Truck Sampler



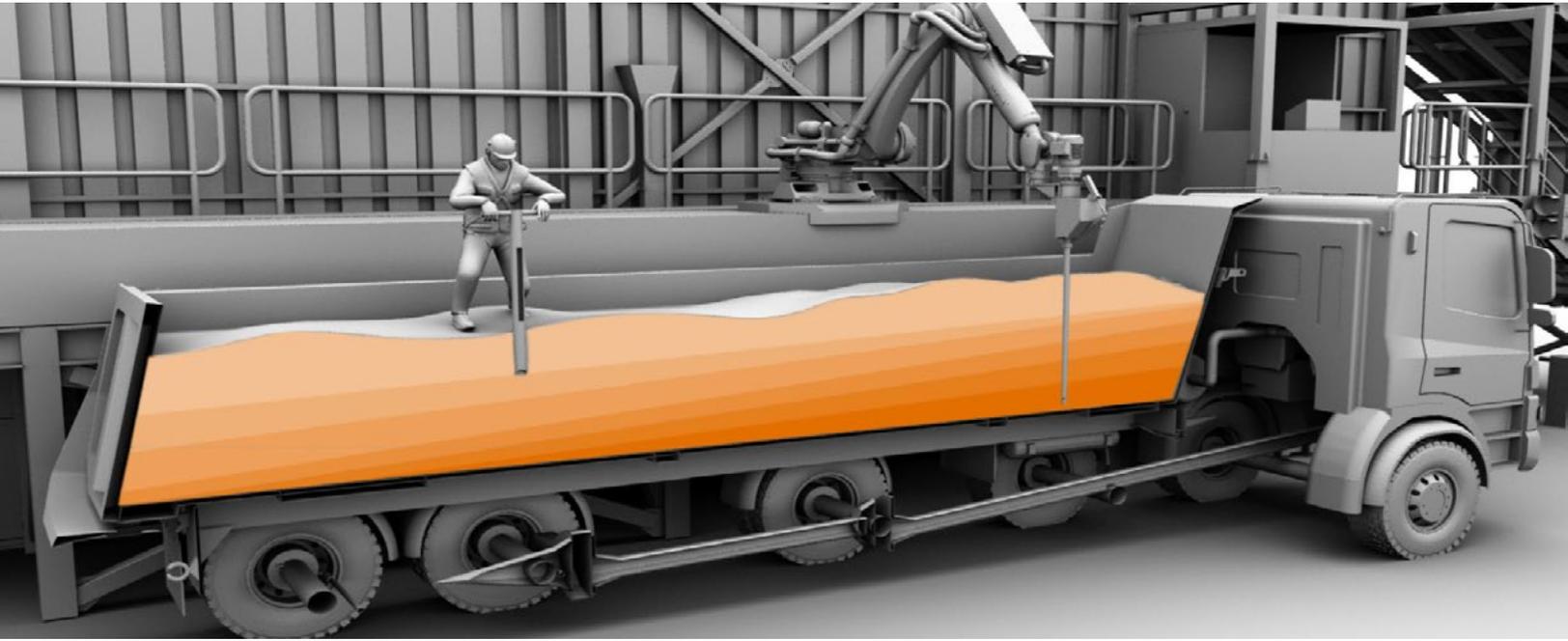
Maxibag Sampler



Train Sampler



Robotic vs Manual



The moisture content and grade in bulk concentrates are often not homogenous. Transport of concentrates by truck or rail exacerbates the non-homogeneity of the moisture content and grade. Manual sampling of these concentrates

does not produce a final sample that is representative of the concentrate, primarily because the sampling device does not completely penetrate the material from top to bottom.



MIRS' robotic concentrate sampling system is designed to penetrate completely through the concentrate bed, ensuring representative and equiprobable samples are obtained. The heart of the system is a specially engineered auger-based sampling tool which is attached to the robotic arm. The tool is made of 316 stainless steel and consists of a servomotor, a cylindrical sleeve, a helicoid auger, and a sample collection box. The tool ranges in size from 2" and larger depending on customer requirements. The auger length, auger tip, helicoid auger flighting, vertical speed and rotational speed are designed based on the requirements and the material being sampled. The system is designed to ensure sample moisture is preserved at all times throughout the collection process. Interior coatings aid in reducing contamination between samples when the tool is not cleaned between samples. The sampling system can be provided with multiple sampling tools, thus enabling sampling of different materials which require different tool design or alternatively, sampling of similar materials from different origins.



Truck Sampler

COMPONENTS OF THE ROBOTIC SOLUTION



SAMPLING ROBOT

Designed to operate in harsh environments. Strong enough to reach full depth in a hopper full of concentrate. Positioned on a rail that allows it to sample the full length of the hopper.

TOOL

Samples the material, stores it and then deposits it for further processing.

HOMOGENIZER

Robot in charge of homogenizing and quartering, and then depositing the sample in the Packaging Unit.

PACKAGING AND LABELING UNIT

Unit in charge of packing the sample in hermetic sealed bags and printing relevant information, such as the truck's license plate, date/time, weight, or others depending on the customer's needs.

TOOL RACK

Contains the different sampling tools, leaving them at the disposal of the system to be automatically exchanged and cleaned in seconds, this allows having tools for each material to be sampled.

SECURITY PERIMETER

Monitored by an electronic controller. It has laser barriers, safety plates and physical barriers that prevent the presence of people in areas of robot operation.

The truck enters the work area of the sampling system, and the truck position is detected. The system waits for the operator to indicate what product the truck is carrying or identifies it automatically by reading the truck's license plate. The sampling procedure is initiated, starting first with the cleaning of the tool. A sample is withdrawn and dumped back into the truck. This cleaning mitigates cross contamination. The full sequence of increments to be sampled is then initiated. To collect a sample, the robot moves along the linear rail to a predefined position, then extends its arm to a predefined location in the truck bed. The location of each sample to be collected is determined by a sampling algorithm in the robot control system. The system can be setup to sample virtually any number of sampling grid configurations and can be optimized by a simple programming option in the system. The robot activates the auger and lowers the sampling tool completely through the material bed to the bottom surface of the truck.

Each sample is stored in a collection box on the robot arm. Multiple samples are collected and stored in the collection box. To deposit the collected sample, the robot moves along the linear rail to the collection station. The sample is deposited through a chute into the sample collection device. The sample is deposited through a chute into the sample collection device, where a small homogenizing robot, homogenizes the collected samples and withdraws a subsample for de bagging and labeling unit. The sample chute is constructed of anti-adherent paint to ensure no portion of the sample adheres to the chute and the sample moisture is maintained. Subsamples can be directly bagged and labeled with the available information, for example origin, date, hour, cart, etc.



PARTNERS



HighService is an industrial services company with offices in three countries and more than 1,000 employees. With four business units, HighService can provide a full range of solutions including:

- Industrial Maintenance and Technical Services
- Engineering and construction
- Technology development
- Applied robotics for mining and general industrial applications.

Mission

To be a world class strategic partner of our clients in the creation of value for their business, through integral, efficient and reliable solutions.

Vision

To be a leading company in the global mining market in the area of specialized services and technological innovation.

Values

- Ethical behavior and professional integrity
- Loyalty to customers
- Respect for people
- Employee development
- Service excellence
- Calculated risk in sales actions

More information at: <http://www.highservice.com>

KUKA

A pioneer in automation and robotics, KUKA Robotics is one of the world's leading manufacturers of robotic systems. KUKA offers a unique and comprehensive range of industrial robots and robotic systems covering all payload and mobility categories. Game controllers and software for all kinds of scenarios complete the KUKA product portfolio.

KUKA, together with its partners, has robotic automation solutions that are perfectly tailored to its customers' industries.

Likewise, KUKA offers a wide range of services, including collaborative planning, commissioning and maintenance to help its customers realize the full potential of KUKA products. In case of emergency, KUKA's technical support is available around the clock.

