

### TRAINERS FOR MINING INDUSTRY TECHNOLOGY

### LUCAS-NÜLLE FOR MINING INDUSTRY TECHNOLOGY

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# Mining Technology

### **Digging for treasure**

THE RICHES OF PLANET EARTH often lie deep beneath our feet. For generations we have mined the ground to obtain the minerals and raw materials we need. This remains as vital today as it ever was. In the twenty-first century, the mining industry is still at the forefront of technological advances. Nowadays, new machinery, techniques and technology are raising safety, efficiency and productivity to new levels. Modern mines are replete with fully automated computer control systems, fluid-powered, electrically powered and diesel-powered equipment and all manner of outlandish, sometimes gigantic, machines. Even technologies like lasers and robotics are rapidly becoming established.

A MINING PROJECT will always have to be meticulously planned, implemented and managed. Everything has to be taken into account, from the geology of the site to the safety of workers. It takes a high calibre of people to fill the many roles key to mining successfully in the present day. Those coming into the business will need to be well schooled in all the disciplines which will be essential to the miners of tomorrow. The future of the industry will depend on training new engineers who are fully conversant with the industry's methods, new and old, who can handle the often complex equipment and who can ultimately contribute their own innovations to its development.



### More Than Just a Training System

### Blended Learning, including E-learning and Hands-On Training.

Lucas-Nülle is a highly respected supplier of training systems, with a focus on providing not only a sound theoretical background but also the practical, hands-on skills that are essential to modern industry.

Using state-of-the-art technology Lucas-Nülle has designed numerous training platforms and systems that include blended learning, e-learning and hands-on systems so that every facet of mining engineering can be modelled and explored individually and discretely.

The systems are designed to parallel as closely as possible the equipment and methods used in practice by industry itself. This means that when the trainees qualify, they will already possess the abilities that they will need as they take the next step in their careers.

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reasons

for Lucas-Nülle

**Mining-Labs** 

### The Lucas-Nülle Mining Lab is a Complete Solution

The company's new range of training aids for the mining industry covers the full range of skills required by the new generation of miners:

### Skills covered by Lucas-Nülle training systems for mining technology:

- Mechanical systems
- Electrical Engineering
- Electromechanical systems
- Industrial conveyor belt systems (IMS)
- Fluid power (pneumatics/hydraulics/mobile hydraulics)
- Industrial controls
- Industrial wiring installation
- Automation technology (PLC and bus technology)
- Instrumentation and process control (IPA)
- Electrical machines and drive technology
- Diesel engines
- Mobile electrical systems
- Electrical power engineering

## More Than Just a Training System

Fluid Power – Hydraulics and Pneumatics Training Instrumentation and

**Process Control** 

Presenting complex training content in a vivid way using modern training media

Complete solutions for process control systems: PLC, AS-i, PROFIBUS, PROFINET, HMI, remote maintenance, safety technology, drive technology with the Industrial Conveyor Belt Systems

Machinery and Systems Engineering

### The Lucas-Nülle Mining Lab is a Complete Solution







Convince yourself of the advantages:



**Fundamentals of Electrical Engineering** 

As in most industries today, mining involves a large amount of electrical equipment. Lucas-Nülle's UniTrain/Labsoft training systems, along with the Classroom Manager administration tools, help you to provide an introduction to the key components and principles of electrical engineering, including motors, generators and electronic components, as well as familiarising students with the use of circuit diagrams and essential measuring instruments.

### **UniTrain - Multimedia Desktop Lab**

#### LEARNING - EXPERIMENTING - UNDERSTANDING

- More than 130 training programs
- Covers the entire field of electrical engineering
- More than 120 measuring instruments and power sources in one piece of equipment
- Promotes individual learning
- Practical skills gained by practical experimenting
- Safe experimenting with safety extra-low voltage
- Training programs combine theory and practice
- Authoring tools and administration

Benefits to you:

## Electrical Engineering

# Fluid Power

### Topic coverage:

- Pneumatics
- Electro-pneumatics
- Simple hydraulic systems
- Electro-hydraulics
- Mobile hydraulics
- Industrial applications
- Troubleshooting
- A multimedia course guides students step by step through the topics



### Fluid Power – Hydraulics and Pneumatics Training Equipment

Mining makes much use of fluid-operated machinery on both large and small scales. This topic covers both pneumatic (air-operated) and hydraulic (liquidoperated) systems and uses Lucas Nülle's Automation Studio to convey the skills needed to understand and control them. The objectives specified by the project description in the hydraulics and pneumatics training set are based on existing practice and closely emulate work done for actual customers from both large and small-scale industry.





### **Industrial Conveyor Belt Systems**

Lucas-Nülle's IMS system is a modular system featuring an example of simple conveyor belt transportation. The belt, along with the IMS sensing and routing stations, can serve as a suitable introduction to conveyor systems used in manufacturing production lines. Basic processes like "positioning" and "speed" can be demonstrated with just this simple equipment. The three-phase motor with frequency converter allows the speed to be continuously modified.

- Making controlled movements on a single axis
- Incremental positioning of a workpiece carrier
- PLC program for monitoring slip and whether a machine is stopped
- Principle and function of various sensors
- Safe handling of various safety circuits and interlocks
- Drive technology
- Generating ramps for frequency converters
- Production line assembly training system
- Wiring installation

Topic coverage:

## Conveyor Belt systems

# Mechanical systems



### **Machinery and Systems Engineering**

Mechanical systems cover the various types of drive and conveyance systems and the principles behind them. The subject includes conveyor belt systems, chain drives, various gearing and transmission assemblies plus clutches and brakes, along with how mechanical systems are installed, operated and maintained. The course conveys methodical technical skills in dealing with mechanical systems. In addition to fundamental background knowledge, the combination of expertise in open- and closed-loop control as well as skills in fine manipulation provides all the capabilities essential to a future career.

- Assembly and disassembly of components
- Belt drives
- Chain drives
- Introduction to the functioning of gearbox transmissions
- Couplings
- Bearings

Topic

coverage:

- Gaskets and seals
- Clutches and brakes
- Maintenance and repairs
- Commissioning and optimisation of configuration





### **Industrial Control**

Industrial control systems are essential to any industrial installation. It is vital that such systems be both reliable and fail-safe. This topic ranges from simple control circuitry to modern PLC systems and their programming. Wiring of electrical systems is another inescapable necessity in the modern world. This topic provides an introduction to many standard circuits used for wiring appliances and power networks as well as IT installations. The training in protective measures that the systems impart includes both theoretical and practical instruction and provides ideal support for both.

### Topic coverage:

#### INDUSTRIAL WIRING INSTALLATION

- Manual and contactor switching in three-phase circuits
- Complex plant circuitry
- Control and instrumentation project
- Plant measurement technology
- Programmable miniature control systems
- "Conveyor belt control" project

#### PROTECTIVE MEASURES

- Standards and terms applicable to protective systems for electrical wiring
- Network earthing systems (for instance, TN, TT, IT)
- Protection against lightning and excess voltage
- Checking electrical appliances after maintenance
- Carrying out tests on built-in systems
- Systematic troubleshooting methods and developing fault-finding strategies



# Industrial Control

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Automation Technology

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### **Automation Technology**

A lot of operations nowadays are carried out by automated systems. Many such systems have programmable logic control (PLC) installations at their core. There is also a growing trend towards the interconnection of appliances and equipment by means of bus systems, which allow for extremely flexible automatic control. All of this demands that today's automation technicians should have been trained using practice-oriented training systems which teach them to understand the latest technology but also endow them with the required hands-on skills to use it.

- PLC programming
  - Computer engineering
  - PLC touch panel models
  - Human-machine interface (HMI)
  - Industrial bus systems
  - Drive technology
  - Open-loop control
  - Troubleshooting





### **Electrical Machines and Drive Technology**

Electrical machines include motors of various kinds which can be used for driving machinery as well as equipment used on the supply side such as generators and transformers. The machines used for training in electrical engineering are designed so that nearly all of the circuitry and drives found in industry, commerce and at home can be covered for educational purposes by means of hands-on training. Many of the components the training systems use are directly adopted from industry itself. That means the systems can focus on the handling and operation (e.g. setting parameters) of real industrial equipment. For instance, using the servo drive/braking system, the response of the drives can be investigated dynamically and statically and using different working machines.

- DC machines
- AC machines

Asynchronous machines

- Synchronous machines
- Frequency converter drives
- Making windings in electrical machines and transformers
- Assembly of industrial control cabinets

Topic coverage:

## Drive Technology

### Electrical Power



### Electrical Power Engineering – From Power Generation to Consumption

Provision of electrical power, whether from local installations or from the national electricity grid, is a subject in its own right. The Lucas-Nülle systems cover this disparate topic in detail but in a way that nevertheless maximises the safety of students. The systems are so extremely versatile that they can be adapted to fit all of the wide-ranging training requirements applicable to electricians, technicians or fully fledged engineers.

- Energy generation training system
- Transformer training system
- Distribution training system
- High-voltage transmission lines training system
- Energy management training system
- Protective systems training system
- SCADA control

Topic coverage:

#### **Instrumentation and Process Control**

Process control involves a holistic approach to the control of equipment which commonly involves feedback from continually monitored instruments and sensors, whereby both automated and manual systems are in place to manage individual systems as well as the entire flow of a process. From closed-loop control of individual systems to flexible automation of entire processes, the various courses convey the fundamentals, the principles and the properties of components used in automated processing and production plant with the aid of animations and numerous experiments involving authentic equipment. Multiple experiments cover investigation of controlled systems, determination of step responses and optimisation of control loops.

- Design, wiring and commissioning of a process engineering plant
- Selection, deployment and connection of different sensors and transducers
- Measurement of electrical and process-control variables like liquid level, flow-rate, pressure and temperature
- Design, assembly and commissioning of control loops
- Analysis of controlled systems and control loops
- Putting continuous and discontinuous controllers into operation
- Setting parameters and optimising P-action, PI-action and PID-action controllers
- Design of open-loop, closed-loop and PLC programs
- Formulation control
- Operating and monitoring processes
- Inspection, maintenance and repair
- Networking process engineering systems





Topic coverage:

## Process Control

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## Diesel Engines



### **Diesel Engines**

Much equipment in the mining industry is powered by internal combustion diesel engines. The Lucas-Nülle common rail training system covers the principles of how such engines work as well as allowing hands-on work with real engines. It is based on the latest technology and educational experience, utilising all today's technical possibilities.

- How an engine management system works
- Design and function of sensors and actuators
- Enhancing diagnostic skills
- Making measurements on the components of an engine management system as done in practice
- Measurement and testing of electrical, electronic, hydraulic, mechanical and pneumatic variables
- Configuration of engine management systems
- Technical communication

Topic coverage:

#### LUCAS-NÜLLE EXPERTISE:

- Supply of laboratory equipment and furniture
- Target oriented project design
- All-in-one services from concept to realization
- Turn-key solutions
- Competent partner in the field of technical education for 40 years

#### FURTHER INFORMATION CAN BE FOUND IN OUR CATALOGUES:



#### TRAINING AND FURTHER EDUCATION IN AUTOMOTIVE ENGINEERING



TRAINING SYSTEMS FOR ELECTRICAL POWER ENGINEERING

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#### TRAINING SYSTEMS FOR AUTOMATION TECHNOLOGY



UNITRAIN MULTIMEDIA DESKTOP LAB