ABB drives training home

ABB helps set up and equip drives training center in Austria

GERALD LIPPITSCH, PAUL DWORSCHAK – Over the past few decades, industrial electrical products have become much more complex and specialized. Not only that, but ever more regulatory and safety aspects, as well as government mandated courses, have come into play in the modern industrial electrical setting. This has pushed the level of expertise required by engineers who deal with this type of equipment to new heights. The foundation of such expertise is a thorough practical and theoretical training experience, carried out in an environment that utilizes the technology currently in use in the field. With this in mind, it was to ABB that the long-established vocational training institute (Berufsförderungsinstitut) in Vienna turned when the institute sought an industry leader to equip its training center with a new state-of-the-art learning facility for electrical drives and power technology.

1 Working with a large selection of modern products means the trainees become familiar with what they will encounter in the field.

For over 50 years, the vocational training institute in Vienna has, in various forms, been providing training to engineers. Over 25 years ago, the institute established a training center, which now provides intensive courses in the areas of building, timber, IT, metals and electrotechnology. It is for this latter area, specifically for drives and power technology that a brand-new facility has been constructed.

Education and technology

A basic prerequisite in the realization of the drives and power technology facility was that it should be open, flexible and constructed in such a way as to perfectly complement the educational content of the courses available. At the same time, a top priority for the institute is, of course, safety, so the design had to be "rock solid" in this respect, while not impeding the learning experience or the flexibility of the facility.

Educationally speaking, a key aim of the enterprise is to bridge the gap between the world of theory and the real world in which the trainees will find themselves when they leave. To this end, ABB and the teaching staff have cooperated to construct the course content. Although emphasis in the electrical drives area has been laid on frequency-converter-fed three-phase machines, a more general, classic DC and AC basic education is also taught. Having completed all of the training units, the trainees should be capable of dealing with both low-voltage switchgear and low-voltage AC and DC drives in a skillful and safe way.

Facility layout

The complete training center was built using the ABB Striebel & John TriLine® modular switchgear cabinet system for rated currents between 100 A and 4,000 A. There are 10 fixed workplaces, one drive assembly workplace and three units comprising mobile, wheeled, 125 A switch cabinets for practical work.

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All of these are fed by a 630 A TriLine low-voltage main distribution board. This unit consists of seven panels, the first three of which are used to connect and disconnect the individual workplaces via a control system using ABB SACE circuit breakers and contactors.

The remaining four panels are used to integrate three existing 20 kVA three-phase regulating transformers with two switchable rectifier sets for the generation of adjustable three-phase AC or DC voltages for the workstations and two 125 A test panels. These latter panels, together with an ABB ACS880 industrial drive, will be used in a second extension phase to build a 55 kW drive and switchgear test bay ➔ 1. This allows virtually all relevant drive systems to be tested using the remaining 125 A test panel. With such an infrastructure, the training laboratory may justifiably be regarded as a truly professional drive laboratory.

A free side wall of the facility provides the location for one more tool for the trainees: A testbed upon which the assembly and commissioning of low-voltage main distribution boards can be practiced. The testbed comprises a TriLine training-level low-voltage main distribution board with a 1,250 A incoming feeder panel, an outgoing circuit breaker panel and a phase-compensation panel. This comprehensive constellation of equipment satisfies one of the main wishes of the institute – to provide an environment that mirrors the real industrial world as closely as possible.

Title picture
ABB played a major role in setting up a drives training facility in Austria. How does this educational establishment cater for such a fast-moving technological sector?

As safety plays a very important role in a facility of this nature, ABB implemented an appropriate monitoring and safety management scheme based on the ABB Freelance hybrid process control system and the AC 800F controller.

Cabinet appointments

The unusual nature of the mission, and space limitations, dictated the design to a great extent. The modular nature of the ABB TriLine switchgear cabinet system that was used provides the perfect solution. Not only that, but TriLine products are employed in the courses themselves; their use throughout lends consistency and harmony to the training environment.

Safety first

Safety plays a very important role in a facility of this nature. Because it was expected to be used by trainees and teaching staff with very different levels of qualifications and experience, ABB developed an appropriate monitoring and safety management scheme based on the ABB Freelance hybrid process control system and the AC 800F controller.

The AC 800F Freelance controller is capable of handling process and diagnostic data from up to four Fieldbus gateways. The non-mobile workplaces and the low-voltage distribution board were connected via PROFIBUS to an ABB S500 I/O and then on to the AC 800F. This occupies one Fieldbus input; the remaining three are free for future use → 2.

The binary interconnects of the Freelance engineering tool Control Builder F are used to perform all the classic PLC-type tasks performed by trainees and teachers alike: switching off and on, voltage interlocking, ramping voltage up to operational levels and so on.

Monitoring, controlling and logging are well-known aspects of the process control world to which close attention is paid in the facility. Without exception, all protection switches, emergency off switches, etc., are monitored. If, for example, a trip occurs in one of the workplaces, the entire facility will go into fault mode. The workplace concerned will immediately be completely electrically isolated. If one of the dual-circuit-monitored emergency off switches is triggered, the entire facility will immediately be disconnected from the mains by an ABB breaker on the main board and the facility will go into alarm mode.

The exact time and location of the fault will be indicated on the facility schematic shown on the ABB DigiVis PLC supervisory control software station, allowing teaching staff to quickly identify which area is involved and react incisively.

As the system architecture of Freelance provides a process level and a control level via the DigiVis tool, all switching actions can be controlled, monitored, followed, checked and logged, thus ensuring safety and transparency. In addition, all switching operations can be viewed by the teaching staff and the departmental management, which ensures legal compliance regarding traceability of operations.

Start it up

The first training modules get the trainees acquainted with switches, drives and other devices. To simplify this part of the instruction, ABB, together with institute staff members, conceived a breadboarding system that allows demonstration circuits to be assembled in the facility itself. These are tested and certified by ABB before use. In this way, the hardware used can be perfectly matched to course content. Since ABB products are exclusively used, the trainees quickly become familiar with the characteristic of the devices, especially the connector schemes, and the supervisory duties of the staff are made easier.

As the training modules become more advanced and move into the realm of three-phase drive technology, yet another ABB product is utilized to assist the students in their education: The AC500-eCo starter kit, including the ACS355 machinery drive for simple motor control. This provides a very flexible and comprehensive multidisciplinary training tool.

The starter kit links learning modules devoted to PLC, drive technology and bus communication. These are often taught separately and combining them into one unit provides the student with a more interesting learning experience.

Practically perfect

Once the trainees have reached an appropriate standard, they can graduate to practical training on one of the three mobile units.

As the largest establishment for adult education in Austria, the institute in Vienna offers a complete intensive vocational training course for technicians.

2 The ABB Freelance controller

3 The mobile motor center

This predicates that the courses have a very strong practical element. To help accomplish this, ABB, together with the institute, developed the mobile motor center ➔ 3.

The AC motor center consists of several ABB TriLine modular switchgear cabinets, into which typical industrial applications have been built. The AC motor center is effectively an outgoing feeder panel to a process-critical heavy-duty pump drive. The three-phase induction motor pump drive system can be operated in three ways: variable-speed control, soft start or direct online start. The required load is provided by an appropriately rated, separately excited DC machine, which is, in turn, connected to a DC motor center.

> TriLine products are employed in the courses themselves; their use throughout lends consistency and harmony to the training environment.

With this configuration, the DC motor center can be used to demonstrate modern DC applications, such as those used in ski lifts, and to simulate loads such as pumps and calendar stacks.

The AC motor center uses an ABB ACS800 industrial drive and an ABB PST37 soft starter. The mode of operation is selected via the ABB AC500-eCo PLC. Both motor centers use state-of-the-art ABB industrial drive technology.

The entire apparatus, with the corresponding circuit diagrams and work instructions, is handed over to the trainees so that they can practice a full commissioning procedure – under strict supervision, of course. The tasks embrace both the programming and loading of the PLC program into the AC500 using the ABB PS501 Control Builder and the parameterization of the ACS800 drive with the ABB Drive Window software tool. They also include an identification run, the manual configuration of the PST37 soft starter, using the local input panel, and measurements and adjustments involving the motor center and the machines during operation.

Similar exercises are performed with the DC motor center on the thyristor-based ABB DCS800 and DCS400 DC converters.

Intensive training on the servo motor center with three ABB ACSM1 machinery drives for motion control applications with permanent magnet motors rounds off the intensive drive technology training.

Looking forward

The vocational training center in Vienna is now well equipped to meet the changes in training requirements thrown up by the rapid advances in electrical drive technology. The center's design has been conceived so as to be flexible enough to accommodate new technology as it appears without having to engage in major, costly rebuilds. For example, the new ABB ACS880 industrial drive series can immediately be integrated into the motor center systems by simply changing a mounting plate.

In Vienna, a new type of universally adaptable training center for electrical drive and power technology has been created with the help of ABB. The wish of the client, the vocational training institute, to establish a modern and forward-looking educational facility for drives and power engineers has been completely fulfilled.

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