## Course description

# Plant Control and Commissioning with MES

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| | Difficulty | Intermediate |
| | Learning time | 9,5 h |
| | Additionally recommended learning media | Basics of an MES (Evaluation), Quick Start - MES (User Guide) |
| | Course type | eLab |
| | Theme category | Factory Automation |

After completing the training on the MPS, the learners know the different functions of the MES and are able to interpret order, process and product data. They know the system and communication interfaces and can independently read out the data relevant to them from the database. By creating systems and products, transport and cycle times can be interpreted and optimized. In the context of predictive maintenance, the learners know the advantages of the MES as well as the different roles and can derive maintenance measures.

| No. | Task | Method | Competency level | Content | Competencies | Learning time | HW/ SW dependent |
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| **Learning unit 1: Basics of production planning and control** | | | | | | | |
| 1 | Basics of production planning and control | Technical exploration | Understand | - Production planning/control<br>- MES<br>- PPS model<br>- Basic terms<br>- Automation pyramid (ERP, MES, SCADA, PLC, I/O)<br>- Delivery reliability, inventories, capacity utilization | - Can classify the advantages of an MES in the context of globalization.<br>- Know the PPS model.<br>- Can reproduce the PPS model.<br>- Know the terms such as on-time delivery, inventory, and utilization.<br>- Know the competing objectives of production planning and control.<br>- Know the different levels of the automation pyramid.<br>- Can distinguish between the different levels of the automation pyramid.<br>- Can classify the automation pyramid in the context of a Smart Factory. | 60 min. | No |
| 2 | Production planning and control on one system | Technical exploration | Understand | - Production planning/control<br>- MES - Internal architecture<br>- OPC UA<br>- Web services<br>- Role concept | - Know the basics of production planning and control.<br>- Can describe the function and tasks of an MES.<br>- Know the difference between ERP and MES.<br>- Know the communication interfaces of an MES (OPC UA, web services,) name.<br>- You know the different roles of the software and the main differences. | 45 min. | No |

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| **Learning unit 2: Smart Production Control (Plan I Control I Evaluate I Optimize)** | | | | | | | |
| **3** | MES in production/ manufacturing process | Guidance text supported Method | Knowledge | ▪ RFID<br>▪ Jason<br>▪ HMI<br>▪ WebSercvice<br>▪ Production process<br>▪ TCP<br>▪ Order, product and process data<br>▪ Order management<br>▪ Message analysis<br>▪ PLC | ▪ Can apply the MES in the context of a manufacturing process.<br>▪ Can read and interpret data (RFID tag) (Turck WebService).<br>▪ Can interpret the different data (order, product and process data) using various production scenarios.<br>▪ Know the various system and communication interfaces.<br>▪ Know the TCP communication protocol used for communication between the controller and the MES.<br>▪ Can launch an RFID transponder on different devices using the web interface.<br>▪ Can commission a mechatronic parts system.<br>▪ Can start a manufacturing process via the MES.<br>▪ Can create and track jobs in MES.<br>▪ Know the communication protocol for communication between PLC and MES.<br>▪ Protocol used for communication between PLC and MES4. | 60 min. | Yes |
| **4** | Production data and control with MES | Guidance text supported Method | Knowledge | ▪ System variants<br>▪ Work plan<br>▪ Order management<br>▪ Message analysis<br>▪ Troubleshooting<br>▪ Quality assurance<br>▪ Trial order | ▪ Know the structure and function of a mechatronic system.<br>▪ Know the process flow of a mechatronic partial and complete system.<br>▪ Can create a new system.<br>▪ Can create a new product with routing in MES.<br>▪ Can create a trial order for quality assurance.<br>▪ Can interpret errors in the process flow (error handling).<br>▪ Can derive troubleshooting measures. | 60 min. | Yes |

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| 5 | Transport and cycle times | Technical exploration | Apply | ▪ Order management<br>▪ Transport and work plans<br>▪ Message analysis<br>▪ Process data evaluation<br>▪ Database SQL<br>▪ Maintenance data | ▪ Know the importance of transparent transport and takt times for the PPS.<br>▪ Can manually determine the transport and takt times on a system.<br>▪ Can export and analyze relevant data from the MES.<br>▪ Can perform database analysis on transportation and takt times.<br>▪ Can adjust scheduled transportation and takt times in work plans.<br>▪ Know the added value of MES data to derive maintenance strategies. | 30 min | Yes |
| 6 | Value stream mapping | Technical exploration | Apply | ▪ Cycle times<br>▪ Value stream mapping<br>▪ Database query SQL<br>▪ Cycle time digram<br>▪ Monitoring<br>▪ | ▪ Can create a value stream of the system with the help of your measured values.<br>▪ Can calculate a product (customer) rate.<br>▪ Can create a cycle time diagram for a system.<br>▪ Can monitor different orders.<br>▪ Know the plant monitoring functions and can use them.<br>▪ Can program a data query.<br>▪ Can customize/extend a data query. | 90 min. | Yes |
| 7 | Webshop Customer View | Guidance text supported Method | Knowledge | ▪ Webshop<br>▪ Database<br>▪ E-commerce<br>▪ Role concept | ▪ Know the challenges of global change and the accompanying opportunities of e-commerce.<br>▪ Know the basic terms in the context of e-commerce.<br>▪ Know the functions of the web store.<br>▪ Know the different roles of a WebShop (Admin/ Customer). | 90 min. | Yes |

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| 8 | Webshop Admin View | Technical exploration | Apply | ▪ Order status<br>▪ Delivery bills<br>▪ Logistig process<br>▪ Data back<br>▪ Webshop presence<br>▪ Price regulations<br>▪ Sales tax<br>▪ Pricing<br>▪ E-commerce | ▪ Know how to classify the different processes (order status I issuing of delivery notes and invoices I logistics processes).<br>▪ Can create products in the webshop (Pricing I Groups I Filters).<br>▪ Know the background to pricing (competitive and dynamic pricing).<br>▪ Know the concept of sales tax (sales tax rates, net and gross price).<br>▪ Know the legal regulations on price quotation.<br>▪ Can prepare product titles, product details as well as product presentation for the online sales channel.<br>▪ Can query data from the database and display it as a table and chart. | 60 min. | Yes |
| 9 | Analysis and optimization | Project method | Understand | ▪ Bottleneck<br>▪ Optimization<br>▪ Output<br>▪ Waste<br>▪ Logistics process<br>▪ OPC UA<br>▪ Communication (Push-Message) | ▪ Can evaluate and optimize the MES.<br>▪ Can identify and classify waste on the system.<br>▪ Know the importance of the bottleneck in production planning.<br>▪ Can identify causes of deviations between planning and reality.<br>▪ Can design your planning to realize the highest possible output.<br>▪ Can derive measure how to increase the utilization of the system.<br>▪ Can derive measures to increase reliability.<br>▪ Can develop scenarios to inform the various responsible parties in an organization.<br>▪ Can optimize the logistics process.<br>▪ Can retrieve status information (slides) via OPC UA (UA Expert). | 90 min. | Yes |