Mobility in the automotive world

Optimal transport is the key to efficient production

zenon®

Content

Mobility in the automotive world

Mobility is the focus of the automotive world. In the manufacturing of vehicles too, the mobility of components, bodyshells and parts is a significant factor in ensuring punctual and precise production. Conveyor systems are responsible for the timely provision of vehicle parts. They are used to transport bodyshells or components between the individual production stations. After each production stage has been carried out, they are then transported on to the next production stage. The transport routes used can be complex as a result of the spatial situation, and thus the arrangement of the different production stages, and the desired flexibility in manufacturing.

Optimal transport is the key to efficient production

The optimal transport of components is the backbone of efficient manufacturing. If the components are not brought together at the right time, cost-effective production is not possible.
Such an important system must be continually and reliably checked for stability and performance. Possible problems or interruptions to production should be rectified quickly and decisively or predicted and avoided. zenon-based control technology is the optimum choice for the reliable monitoring of conveyor systems.
The basic package of the zenon HMI/SCADA system already offers many functions that are perfectly suited to application in conveyor systems, without additional specialist module costs, such as:

- Distributed and networked systems with the option of many clients for on-site monitoring
- Powerful multiple project administration for easier engineering and maintenance of distributed systems
- Option of multi-driver architecture to connect different control, logging or read stations in the periphery
- The zenon World View Screen function to display complete equipment layouts with intuitive navigation and the infinitely variable zooming of display details
- Connection to different logistics computers or manufacturing control systems for the integration and display of superordinate systems
- Development system with an emphasis placed on good usability, based on modern standards and which supports the reuse of objects when configuring projects

Cloudy with a bright outlook Outlook cloudy and bright

Cloud computing is appears to be the current prevailing trend in IT. The principle here is that data from different computers is saved in the ‘cloud’, which can then be viewed or edited at other locations. It is quick and easy to create such a cloud for equipment data using zenon.

Using zenon’s network functions, the distribution of conveyor technology data across the network can be achieved in just two mouse clicks. zenon’s powerful network functionality is on the result of COPA-DATA’s years of practical experience. Despite the complex interrelationships in the background, it is easy to configure for the user: a server is defined for each zenon project when a zenon network is activated.

The server has the ‘data sovereignty’ for that project: this means that it, amongst other things, communicates with the PLCs and that the clients are supplied with data. Using zenon, the server PC is defined solely by the configuration of the project. You don’t need additional software components or server operating systems: a functional network is all that is required. All these network functions are an integral part of zenon.

The zenon server ensures uniform data and project consistency within the cloud when in operation. If project updates are carried out, the project configuration engineer need only make the changes on the zenon project server and can then update this zenon “download” function whilst the application is in operation. Once the server has downloaded it’s project, it automatically informs all connected clients of the changes to the project. The clients actively copy the project changes into their local memory and also refresh their Runtime. This all works automatically – the user only notices a progress bar being displayed briefly. The whole system is in full, normal operation at all times. If a client is not active at the time of the project update, perhaps because it has been switched off for maintenance reasons, when it becomes active again it automatically compares the project status with that of the server and synchronizes data if necessary. The project data is thus always up-to-date within a zenon network – everything runs fully automatically – without additional work for the user.

The process is the same for data that is read off from or written to the control units in Runtime, as well as data that is provided by the server for further processing.

In the zenon network, the server communicates with the connected control units and distributes this data to the clients. The zenon system uses some optimization methods here when distributing the data, so the communication load across the network is minimized. In doing so, zenon only communicates data from the PLC that is currently required: this could include data that is displayed on a screen, data that is monitored for alarm processing, or data that is stored in the long-term archive. As a result, spontaneous, event-controlled communication is integrated consistently.

Example: a screen called “Detail Skid 1234” is opened on a client. The “static” screen information is immediately available to the client because, as we’ve discussed, it always has the current project data. Now the client reports internally to the server that it needs the variable values that are to be displayed on the screen. The server obtains this data from the respective control unit and provides the values back to the client. After initially

reading off all variable values, further communication between the PLC, server and client only takes place if a value changes. Therefore data packages are always transferred at an optimum size.

In addition to “classic” client-server systems, redundant systems with “hot standby” computers can also be implemented with zenon. Here too, only one additional PC need be configured as a standby server. This standby server communicates with the control units whilst the system is operating, but does not carry out any write functions. However, internally, all data is buffered in a configurable time-window. If the actual server subsequently fails, the standby server takes on its tasks. It can track all data, without exception, using its own communication channel to the control units and undertakes internal buffering of all values, messages and events. The standby server is upgraded to the “new” server and actively informs all clients of this change to its status. These mechanisms are built into zenon and are carried out automatically. As a result of this, a system with high availability can be implemented simply by setting just a few parameters during project engineering. That’s the power of zenon’s robust network technology.

Integration of distributed projects

When using zenon multiple project administration, several projects are started with one Runtime. For zenon users, there is no need to configure or program this functionality – you can just use it. You can find detailed information about the capabilities of zenon’s multiple project administration in our white paper entitled “Project Structures and Maintenance”, but we will provide some pertinent information here.

With zenon’s multiple project administration, a project hierarchy can be created simply by dragging and dropping in the zenon Editor. Projects can be combined, using an integration project. This means that it is possible to exchange data between projects without opening further communication channels to the control unit. Overview screens with data from different PLCs can be implemented quickly. The integration project can use the data from the subordinate projects directly.

The alarm message lists or chronological event lists of the individual projects can be quickly compiled into central lists. In this way, the messages from the different sub-projects can displayed in a single screen, so the information is together in one place for the user. A uniform display and comprehensive sorting and filtering options ensure consistency throughout all projects.

As a result of the consistent use of these mechanisms, a control room project which offers a global overview of all areas in the conveyor system can be quickly created. Nevertheless, the various projects relating to the individual areas in the conveyor system can be operated on-site on a decentralized basis using this method. Whether running autonomously or not, only the screens and elements that the user needs - and is permitted to see and operate for security reasons - are available at the stations on site. A summary of the same information is available centrally in the control room. In this way, zenon delivers considerable added value with minimum of configuration effort.

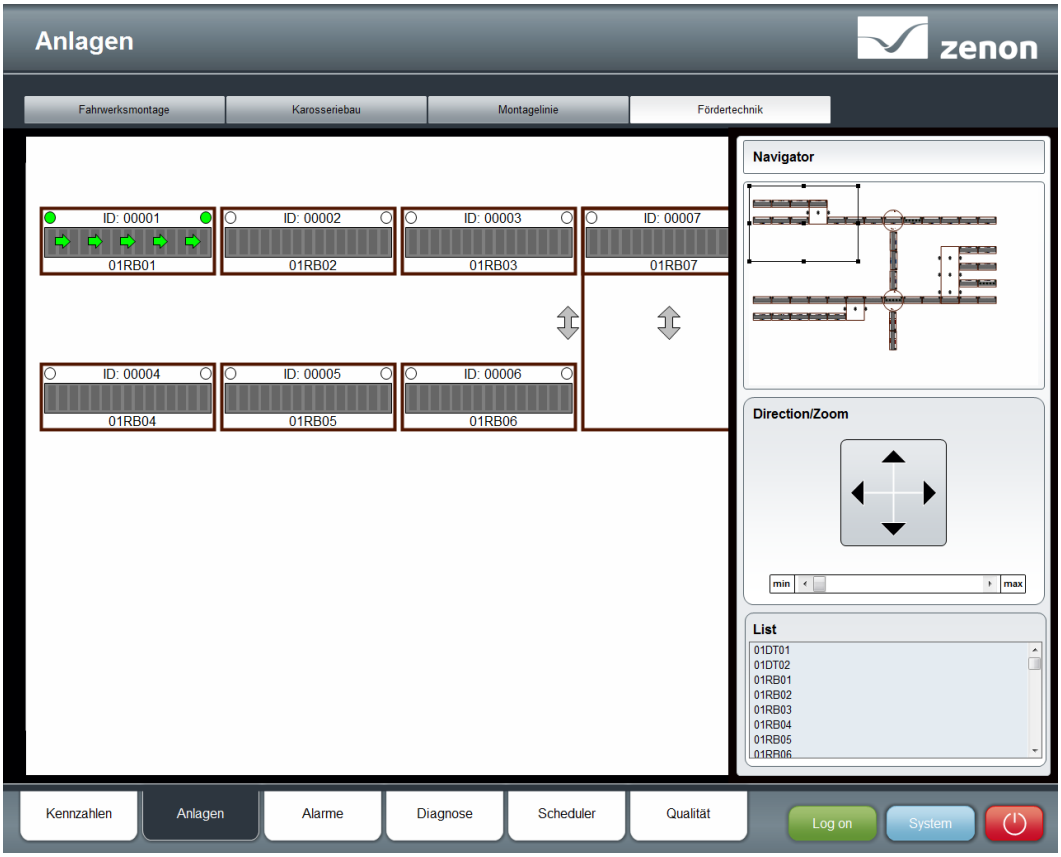
Communication to the control level

zenon is a communication professional: because it supports more than 300 communication protocols with a direct driver, many control systems can be connected. In general, a connection is made without intermediate layers, as displayed by an OPC server, for example. The zenon direct driver uses the communication protocols of the PLC manufacturer. These drivers can often be used without further control modules. Connection is therefore possible whilst the system is in operation. All these drivers can be integrated into zenon projects at the same time. Multiple use of a driver type, for example, to communicate with several control systems is also supported. Therefore many channels for communication with the subsystems can be created.

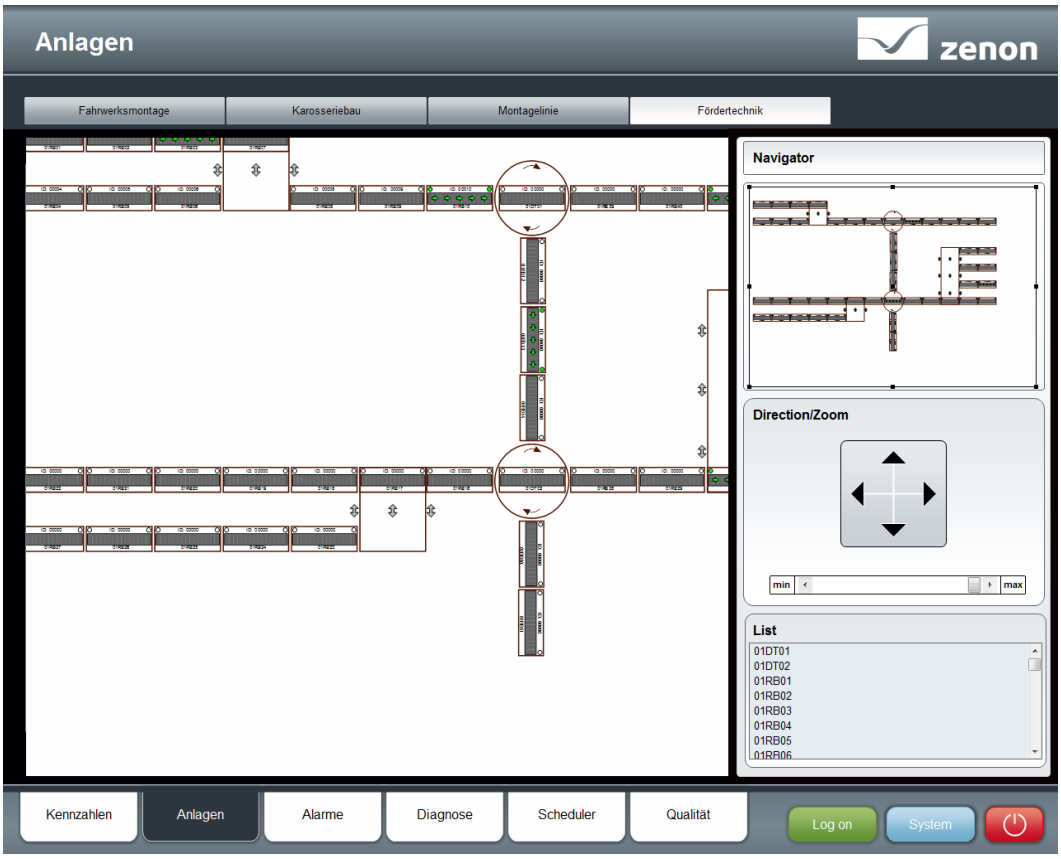
The zenon World Screen – freedom from screen resolution constraints

Usually the layout of the transport system is shown in conveyor system projects. The user, therefore, will have an overview of the current status of the system and can recognize the locations from the positioning on the screen. However, when configuring such equipment screens, engineers can often reach the limitations of the monitors used: equipment layouts can often only be incorporated into the selected screen resolution with difficulty. Although zenon can automatically adapt to different monitor resolutions, the screen elements must be reduced in size to display long conveyor routes, for example, in order to display the whole system.

An alternative approach to the display of conveyor technology layouts is the use of the zenon World Screen. A zenon World Screen view avoids size limitations resulting from the selected screen resolution. It can be created in any desired size and also maintain the size ratio of the actual transport systems: long, narrow systems can thus be displayed in long, narrow screens. An additional system screen, the “World Screen Overview Screen“, can be used to display multiple zenon World Screens and navigate through them. The displayed content of the layout screen is directly influenced by the overview screen. This control screen provides the user with elements to move the layout screen or to enlarge or reduce the size of the content. Individual elements can be activated or deactivated on the display to increase clarity.



World Screen view without zooming for the detailed view

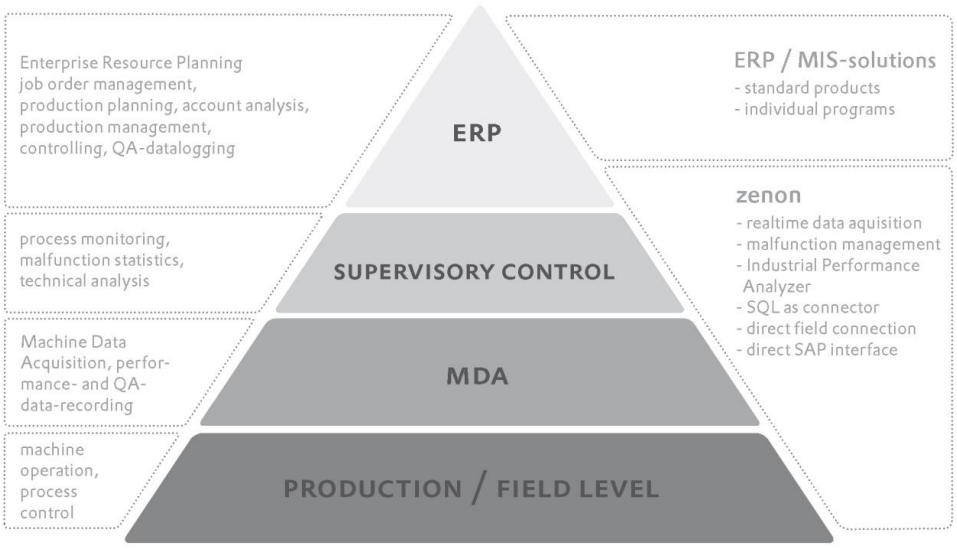


zenon World View Screen zoomed to give an overview of the entire layout

The World View Overview Screen automatically creates a list of the conveyor system elements from their name in the layout screen. The user can use this to directly select individual screen elements. Regardless of what is currently being displayed, when an element is selected the user can ‚jump' directly to it.
The user experiences a “Google Earth” feel when using the zenon World View Screen to view or monitor their conveyor system. As a result, the zenon World View is highly appreciated by users thanks to its intuitive operation.

Consistent flow of data

As already described above, communication is one of the many strengths of zenon. In addition to the multitude of connection possibilities at control and data point level, there are also many communication routes to manufacturing control systems, MES or ERP systems. A frequently used method for exchanging data is the database interface. Due to the use of an OLE-DB connection, an interface to all commonly-used database systems is offered. It is possible to connect to external systems in this way. For example, this method can be used to exchange data with logistics computers. As a result of this, information from the logistics control system can be displayed in the different conveyor system screens. Control commands for “manual discharge functions”, for example, are possible - naturally with appropriate password verification for user authorizations and automatic logging in the chronological event list.
Due to the central construction of the overall system – as described above with a server-client structure and multiple project administration – information from logistics can be displayed to on-site installed clients. This additional information makes the interrelationships and the process more transparent for the user. This contributes to the overall efficiency of manufacturing.



Automation software: zenon functions as a HMI and SCADA system from the machine through to the control room with interfaces to superordinate systems

The SAP ERP system is often used in the automotive industry. Special SAP modules coordinate the use of personnel and material for maintenance activities. To determine time periods for maintenance work, measurement data is often entered manually into the SAP system. With the certified zenon SAP Interface, these error-prone manual entries can be automated. Measured values from the control level or messages can be transferred directly to SAP using this zenon

SAP Interface. This interface is designed to be bi-directional. With the values transferred to SAP by zenon, SAP can trigger actions that are then reported back to zenon in the form of control commands. The zenon interface uses a direct interface to the SAP system and was tested, approved and certified by SAP accordingly. Use of this interface is possible without further programming and naturally offers many other possibilities for application and use.

SAP® Certified
Integration with SAP Applications

Certified interface for HMI – ERP communication and SCADA – ERP communication

SAP Partner

COPA-DATA is an SAP Partner

Rapid results

The zenon Editor is the universal tool for design, configuration and maintenance of zenon conveyor system projects. The zenon Editor supports automation project engineers in carrying out their tasks. COPA-DATA has carried out many workshops for users together with specialist Institutes with regard to zenon's operation and capabilities. The findings of these workshops help COPA-DATA to continually improve the usability of the zenon Editor. As a result, the zenon Editor supports automation project engineers working with large amounts of data, such as many variables, for example. zenon does this by responding quickly and by offering the option to sort or filter according to chosen criteria. It is also possible to change the properties of all marked elements (multiselect). Technologies such as drag & drop, format transfer, configuration using sliders and the automatic alignment of several screen elements are used to create the graphical images.
To create conveyor system elements, zenon supports object-orientated project configuration. The basis for the description of the interface to the control level constitutes a structure data type in zenon. This data type reproduces the abstract variable structure of the control. In general, major parts of the data type description are taken on by the PLC program. However, frequently, it is the case that not all data from the PLC is required in the visualization system, so there are minor differences in the data types.
Screen symbols can be developed according to this interface description, the graphics of which correspond to the conveyor system elements. Due to the structure elements of the data type, there is a direct relationship with the

description in the control. This symbol is saved in a library for subsequent reuse. This symbol, like that of the structure data type, also only constitutes a “basic body” for the actual display.
Using these methods, it is possible to rapidly create standard templates which correspond to the individual conveyor system elements such as skid, lifter or junctions. But abstract elements, such as operation filed, sliding registers or pre-selection buttons can also be stored in this way in a global library. Based on these templates, the projects can be created for the different areas of conveyor systems. In this way, variables are created that are based on the standard data types. Standardized properties from the data types are automatically transferred to the variables in the process. In doing so, the connection to the data type remains. As a result, when changes or additions are subsequently made, these need only be carried out at a central location – the data type – and zenon then forwards these to where they are used – the variable location.
In practice, each conveyor system element receives a corresponding element in zenon, in the form of structure variables. The symbols from the libraries are used for the graphical display in the various screens. If a symbol from the library is inserted by dragging & dropping, a dialog automatically appears through which the template interface is converted to the actual structure variables. Because consistent structures are used in the process, only the basic name of the structure needs be replaced here. All structure elements are automatically replaced by means of central definition in the data type.
Changes to linked symbols from the libraries can also be made centrally at one location – in this case in the symbol library. These are then automatically forwarded by the object-orientated project configuration to the locations where they are used in the screens.

Outlook

In this document we have only provided a brief overview of some of the capabilities of zenon which are ideal for use with conveyor systems. In one of the coming white papers, I will discuss the practical application of zenon in a conveyor system in more detail and provide examples.
The capabilities described here naturally also have a wider application and can be used in other areas or with other technologies. We are happy to support you in the identification and specification of your requirements as well as the planning and implementation of your solutions.

Our automotive experts are available for you at any time. Contact us at www.copadata.com or by email at automotive@copadata.com