At a Glance

- Logic and optics are separate
- Web technologies provide flexibility
- Object orientation combined with web visualization
- Simple to operate and open for everything
- Responsive design delibertely avoided. Rather, operating elements flexibly allocated
- Combinable with any hardware via HTML5 and OPC UA

Great Freedom via Web Standards

Web-based visualization simplifies the development of complex operating interfaces

For this year's SPS IPC Drives, SIGMATEK will be introducing a new visualization solution with the LASAL VISUDesigner. The basis is formed using current web technologies, which are largely hardware-independent. A graphical editor and extensive libraries enable visualizations to be created without programming knowledge. Open source controls (operating elements) provide space for individuality and creativity. Author: Maximilian Leschanowsky
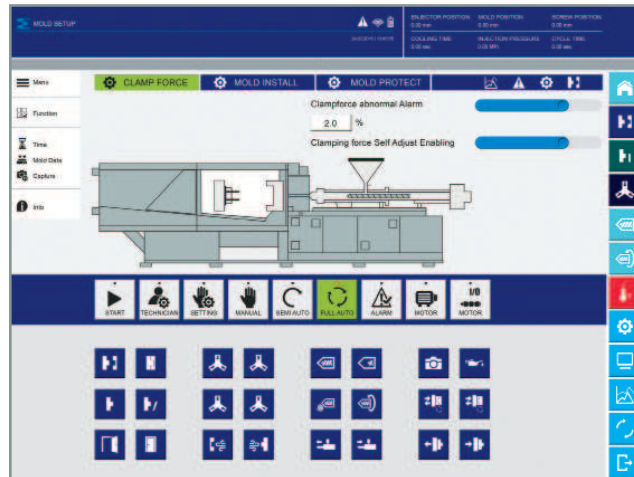
Internet technologies such as HTML5, CSS3 and JavaScript form the basis of the LASAL VISUDesigner.

all pictures: Sigmatek

T he visions and goals of Industry 4.0 require flexibility and openness from production systems – especially in regard to what is required for displaying and processing data: Data provided in the Industrial Internet of Things (IIoT) is no longer bound to a specific location within the automation solution.

The Challenge: Operating and Monitoring

Future machine generations will make increasingly more autonomous decisions. Nevertheless, or precisely for that reason, monitoring and operating continues to be an essential function of machine automation. At the transition into the world of new production however, the demands on the visualization have changed:

It is no longer enough to equip a machine with just one monitor along with specific display and operating software. Today, operators already expect to find a task-specific terminal at different locations on a machine – often on each individual options module. A consequence of this development: The use of mobile operating devices is increasing. After all, each terminal costs money. Mobile access to visualizations via Internet browser should simplify maintenance. After all, management expects to have access to information and options to intervene via office computers and mobile devices. When possible, across machines as well as from outside the company. In short: The expectations of modern visualization are characterized on all levels by the user

Easy configuration of complex visualizations and at the same time, freedom for HTML5 specialists – that is what the LASAL VISUDesigner offers.

comfort provided by today's smartphones and tablets. The creation of visualizations has always been comfortable, even over multiple automation projects. To support automation software eng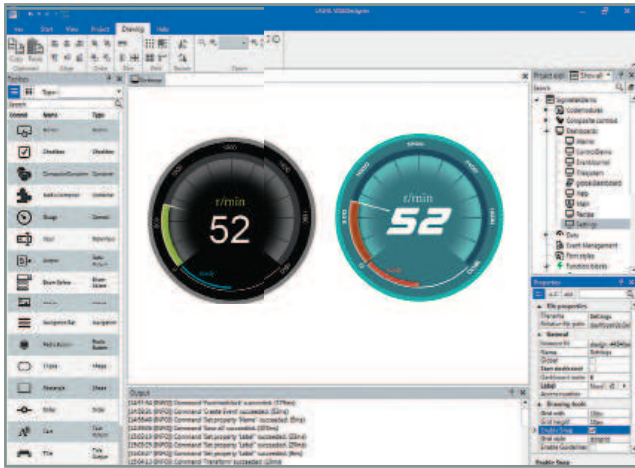ineers in accomplishing their future tasks, SIGMATEK has spent the last year and a half developing a completely new, flexible and open visualization tool. The operating philosophy however, has remained similar so that engineers using the current LASAL visualization still feel at home.
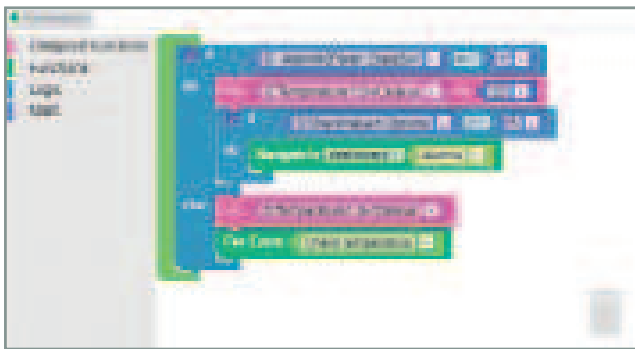
Visualization Redesigned

The technical basis for the VISUDesigner is formed with HTML5, CSS3 (Cascading Style Sheets) and JavaScript. This in turn provides the user with significant benefits: The HMI code is manufacturer-independent, and the visualization is detached from the automation solution. This also gives the visualization the ability to run on different display devices. Data can also be processed via OPC UA. This allows the simple integration of multiple control systems, as well as different products and data sources, up to individual sensors in an application.

To design standardized user interfaces across multiple screen content, an extensive selection of design themes is available. The use of scalable vector graphics (.svg) enables the adaptation of graphic elements to different screen formats. This makes it easy to create a visualization solution with variations for different target devices.

After completing field testing, SIGMATEK consciously decided against a responsive design common in today's web design. The reason lies in the often sophisticated operating concepts of machine builders. This requires that the exact positions of all

The graphical editor and symbol libraries enable visualizations to be created via simple configuration.

The logic behind the graphic elements can also be assembled in the VISUDesigner without extensive programming knowledge using puzzle-like elements in a graphical editor.
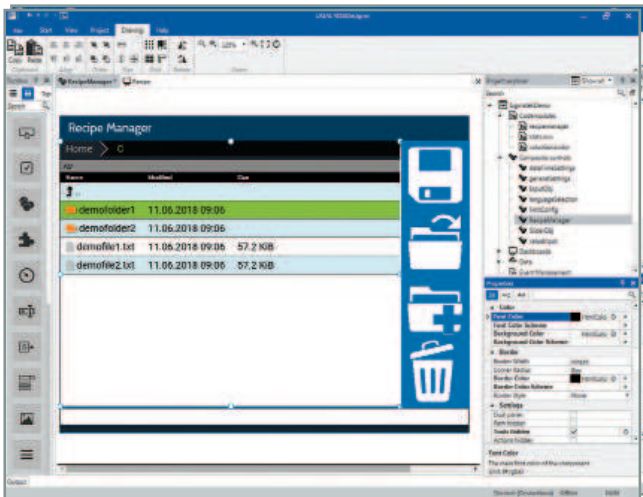
on allows machine builders to implement visualization projects in many display variations; for different user groups or in OEM customer-specific themes. Debugging, improvements or functional changes must only be made at one location and are then valid for all.

Unlimited Adaptability

The HMI tool is constructed like a modular toolkit system and supports multi-touch interactions. Only though configuration comprehensive visualization solutions can be created. At the same time, programmers and visualization experts have complete freedom to utilize web technologies: Individually designed graphics and controls, animation, videos and audio files can be easily integrated. The predefined operating elements are largely open source. Not only can users simply implement them, but also adapt or modify them as desired. Existing operating elements can be grouped into 'composite controls'. An example thereof would be recipe management assembled from buttons, input fields and a file explorer. User-defined controls can also be integrated: Usability and individual design are limitless. Since the visualization is completely separate from the machine logic, the programmer does not have to worry about the internal interactions of the target system. They can focus on the ergonomics of the user interface. The visualization can therefore be created independently from the automation solution. The VISUDesigner supports working in development teams, including source code management and version control. This allows outsourcing the task to specialized service providers.

Quickly to Secure Results

Integrated administrative functions such as localization support with language and unit conversion, as well as user management enable quick development. The latter allows the role-dependent definition and assignment of various access modes,

elements be determined so that they can be found at a precisely defined position when the layout is transferred to other aspect ratios. If only the screen size changes, the target resolution adjusts automatically; the position of the elements can however, be configured individually.

Fast and Intuitive Visualization

Visualization developers can utilize the advantages of the web technologies in the VISUDesigner, without having extensive expertise. The intuitively designed operation of the fully graphic HMI editor ensures this decoupling: The graphical interface is designed and configured using modern design themes, as well as an extensive library of predefined display and operating elements. These include buttons, sliders or menus as well as frequently used functions, such as trend display or recipe management. The graphical editor follows the `What you see is what you get´ (WYSIWYG) principle. During editing, the developer always sees the progression of the screen mask as it will later appear on the selected target device –

operating panel, tablet or smartphone. Via the online preview, the operating concept can be tested: The complete visualization can run via the network connection using actual machine values without an HMI. Content and layout are completely separated, the visualization's configured logic is independent of the graphic elements used. The logic can also be assembled in the graphical editor without extensive programming knowledge using puzzle-like elements (function blocks). The advantages of object orientation are also useful in the visualization. Like the graphic elements, the underlying functions can be reused

> *The comfort of today's smartphones and tablets characterizes operator expectations.*

and modified as desired. Optics and functions are connected with one another through simple references. The separation of content and appearance of the visuali-

The graphical interface is programmed and configured with design themes and an extensive library of predefined controls.

including an authorization check for mobile access. The developer is also freed from having to worry about secure data exchange between the web-based visualization and sequence or process control. This is performed via secure encrypted connections. For continuous project testing, the HMI tool provides options for simulation. With the LASAL Runtime System (LARS) simulation tool, the interaction between the visualization and automation solution can be tested before a physical prototype of the machine even exists. This not only accelerates creating the visua-

> *Web standards decouple the visualization from the control and operating panel.*

lization, but also shortens the initial start-up on-site. The separation of content and optics allows the flexible adaptation of the design's individual components without affecting their contents. Usability improvements can therefore be made later without having to change the application. In many cases, this saves the need for a new certification.

Requirement for Plug & Produce

The visualization solutions created use a resource-conserving HTML5 browser specifically optimized for this task and therefore also performs well on less powerful hardware. The visualization solution is therefore also suited for applications under high cost

pressure, as well as machine concepts with option modules. This is where the ability to define limit values as nested variables proves advantageous. The parameter sets of currently available options can be therewith dynamically loaded and visualized. The visualization does not need to already know the exact configuration of the machine at the time of delivery. This provides dynamic integration of configuration variants. The LASAL VISUDesigner thereby creates the condition for modular machines with plug & produce capability.

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