Franz Aschl

ON A LONG LEASH

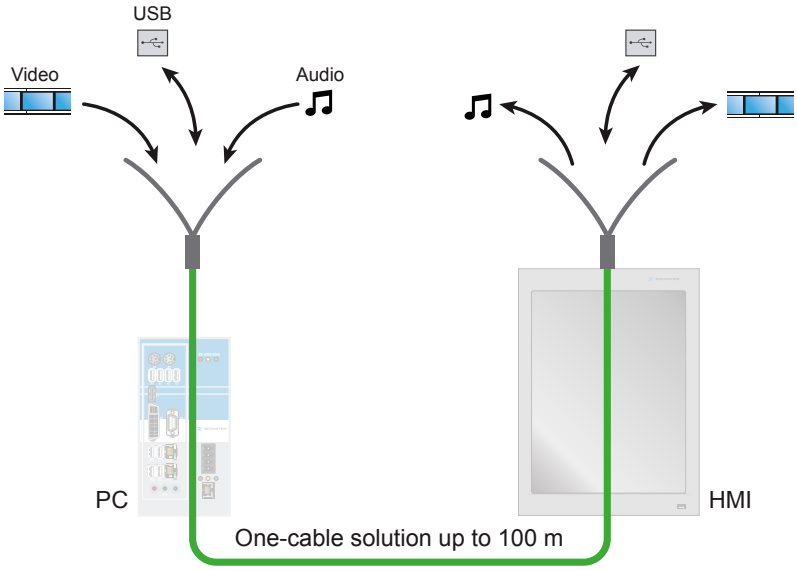
When it comes to larger machines and systems, the almost unlimited scalable computing power of industrial PCs encourages advocates of central control concepts to follow the motto: "Back into the control cabinet". The performance of the human-machine interface however, must not suffer.

Increasing complexity and a continuously growing range of functions also pose new challenges for the human-machine interface. The HMI concept must be tailored to the respective process as flexibly and perfectly as possible. Machine builders therefore demand efficient operating solutions that provide such modern functions as USB and on-site audio, multitouch, flicker-free images and last but not least, Safety. However, the required computing power cannot increase into infinity and the HMIs must remain compact.

For smaller machines, the all-in-one concept is in trend. The basis therefore is high-performance control panels, which enable a combination of control and operation. In contrast, users of larger machines and systems follow a different concept: A central control unit combined with robust, decentralized on-site operating units.

Both the operating comfort and machine availability can be thereby increased. If also located far away from a PC unit, the operating personnel always have the required data and process in view. A more efficient and smooth production process can be thereby achieved. The machine availability also increases, since the industrial PC is mounted in protected surroundings with controlled environmental conditions.

To meet these new demands for complex machines, SIGMATEK is moving forward with a new generation of remote operating panels that eliminate an annoying, cost-intensive problem with central control units: The transmission of the diverse HMI signals. There is certainly a solution with video,



With HMI-Link, all communication between the display and the control cabinet PC is made over a standard Ethernet cable: all digital signals for the screen, the return messages from the touch interface as well as USB, audio and Safety signals.

USB 1.1 and S-DVI over a cable, but the resolution is limited to a maximum of 1024 × 768 pixels and 16-bit color depth.

One Cable for all HMI Signals

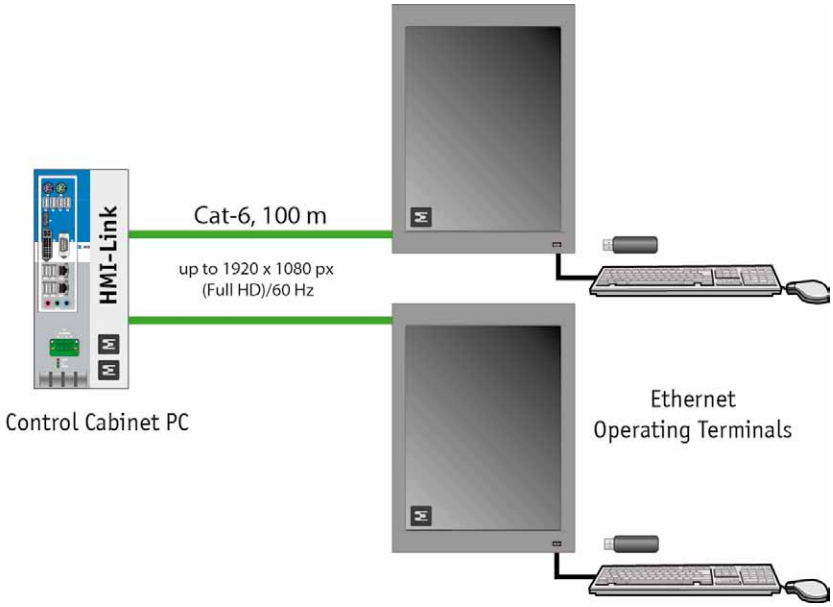
The Ethernet terminals are completely different: They enable remote HMI solutions with a distance of up to 100 meters between the operating terminal and control PC. This is based on data exchange technology that is independent of operating systems and sends all information to the remote display over a single standard Ethernet cable without data loss. Even the transmission of Safety signals such as emergency stop or confirmation buttons are included in the data exchange concept. Specifically, the following is transmitted:

- the digital signals for the screen,
- the touch system information
- as well as USB, audio and Ethernet.

Thanks to HMI-Link, the Ethernet TAE 1911 operating panel needs neither a hard drive, processor nor a fan. This results in higher mechanical robustness and a flat design.

Conventional USB connections can only reach as far as five meters, a standard DVI interface manages double that distance. With 100 meters, the Ethernet solution of these two PC interfaces is ahead by lengths. The data is transferred from the central control to the operating unit without the use of non-safe hubs or switches. In addition, the specified Cat6 cables are a significantly less expensive alternative to a DVI cable.

The DVI, USB, Video and Safety signals are tunneled through the Gigabit Ethernet cable and fully provided on end device without data loss. The data exchange technology offers enormous advantages, as in addition to more extensive visualization data, videos for simple initial start-up and service



With HMI-Link, not only can several remote screens be operated, it is also possible to combine several screens into one large display; as in a control station for example.

purposes are increasingly available to transmit and view. To display these in good quality, a lot of computing power is normally required. With the "HMI-Link" process, loading times were optimized so that videos can be shown flicker-free in Full HD (1920 × 1080 pixel resolution) and 24-bit color depth. The common Thin-Client solutions have mostly problems displaying images without "flicker". The reaction of the screen to operating input with thin clients is anything but fluid. Through the hardware-based approach, the HMI-Link concept from Sigmatek is an efficient and trend-setting solution for remote operating units.

HMI Terminal Freed from Ballast

The TAE 1911 Ethernet operating panel is one of the first devices with HMI-Link. Since the terminals operate without an internal processor, they are significantly less expensive. Unlike Thin-Client applications, there are no drivers to install. Even with the parallel operation of several visualization runtimes, the computing power of the PC is not burdened with HMI-Link. Furthermore, the need for additional licenses is completely eliminated.

Even the settings for network addresses or masks are unnecessary with the hardware-based solution, which makes servicing considerable easier. The system is not limited to a specific operating system and therefore provides complete freedom. With the elimination of a hard drive, CPU and fan, a complex on-site cooling system is not needed.

This guarantees higher a mechanical and thermal robustness of the terminal as well as a flat, space-saving design. In portrait format, the TAE 1911 measures 360 mm × 462 mm × 57 mm (W×H×D) and has a 19" TFT color display with LED backlighting. In addition to the Ethernet interface for the HMI-Link, the new generation of TAE panels has a USB 2.0 connection on the front and backside.

A chip card or RFID reader can be optionally integrated to ensure that only authorized personnel can operate the terminal. A small version with a 15" diagonal is also planned.

The Sigmatek solution provides the connection for multiple displays to the same control cabinet PC. Several operating terminals can therefore be installed on one machine, since they all display the same visualization.

This increases the operating comfort - especially with very large machines - and also provides a certain safety factor: If an operating panel should fail, the system can be controlled and operated from a different terminal. For extremely complex visualizations, several panels can be combined into a single multi-monitor unit similar to ope-

The counterpart to the operating terminals: With its Intel-Celeron G530T processor and solid state drive, the control cabinet PC 301 is state of the art.

rating solutions for a control station. The solution for several application scenarios is thereby covered.

Plenty of Computing Power in the Cabinet

In the protected and easily accessible control cabinet, the computing power can be more simply adapted for example, after a system expansion or with modular machine concepts. Since most control cabinets are equipped with a fan or cooling unit and do not "feel" the higher heat dissipation after a computer upgrade at all.

Despite increasingly shorter life cycles of PC standards, it is therefore possible to use on-site operating units that are "reduced" to the essentials several years beyond the life span of the PC. As a result, various performance requirements and new processor generations do not require an exchange or upgrade of the operating panels.

The system costs are thereby reduced while flexibility is increased. The control cabinet PC 301 - essentially the counterpart to the TAE terminal - with an HMI-Link interface serves as the central computer. It is equipped with a modern 2.0 GHz Intel Celeron G530T processor from the newest Sandy Bridge Duo series. 2-Gbyte DDR3 RAM is provided as main memory.

In the standard model, an 8-Gbyte solid-state drive (SSD) serves as the storage medium. Through the elimination of mechanical components, this technology has the advantage of being more robust against vibrations and impacts compared to conventional hard drives.

This technology also significantly reduces the access times for stored data and the energy consumption sinks considerably. The PC 301 is not only suited for use in harsh environments, but is also energy efficient. In addition to the HMI-Link two standard Ethernet ports (100/ 1000 Mbit/s), eight USB interfaces (2.0), an RS-232 and a DVI interface are provided. Included are three audio outputs as well as connections for a mouse, keyboard and display.

The computer can be individually expanded as needed with two PCI insert cards. In combination with the HMI-Link, the Ethernet TAE 1911 and control cabinet PC were especially designed for demanding applications and are used in various industries such as plastics and glass, the food and pharmaceutical industries or also in energy, building, monitoring and control station technology.

Franz Aschl

is Innovations Manager at Sigmatek in Lamprechtshausen, Austria.