

The Truth About “OPEN” Control Systems

Do not be misled by other engineering companies that advertise “non-proprietary” control systems. ALL control system parts are proprietary. If a particular control system vendor uses XYZ PLC and the parts are commonly available it does not imply that XYZ PLC based system is not proprietary. The user still has to purchase software and hardware from XYZ supplier.

There are two ways to approach control system design: brute force approach and elegant solution. Many other vendors are using the brute force approach where many signals have to be conditioned to and from a 4-20 mA signal because the PLC platform they chose does not support the type of I/O necessary. Also, dozens of interposing relays, fuses and terminal strips need to be hand wired to the control system because the PLC modules cannot handle the loads present in power plant systems. All these hundreds of connections are a risk of coming loose which can be a nightmare to troubleshoot. TDS chose the elegant solution. TDS developed termination boards to eliminate all hand wiring needed by PLCs into a pre-printed circuit board. No wiring errors and minimal potential for loose internal wiring present. All the I/O is fuse protected when appropriate. All analog signals have a shield termination adjacent to the signal termination to avoid “spaghetti shields”. These boards are all very simple two layer through hole design. They are very simple to repair should any problems develop. TDS has developed custom I/O modules to perform all the functions that cannot be performed by existing PLC I/O modules. This brings a fully digital interface to the vibration monitoring, speed input and fuel/steam hydraulic control valve modules. The way it should be!

Most PLC based control systems are programmed in ladder logic. Ladder logic is a language developed during the ‘70s to minimize technician training when most factory control systems were relay based. It was developed to control digital devices such as solenoids and motors. Over the years extensions have been added to handle analog computations while still retaining the ladder feel. This works well for simple analog control schemes but easily gets confusing when trying to implement sophisticated control schemes. Early turbine control logic was easily adapted to this type of language. However, as the complexity of the controls grew it exposed the limitations of ladder logic. Today control systems programmed in ladder logic are difficult to understand and troubleshoot. This is because every control function has to be constructed from primitive analog functions like comparators, math functions and copy blocks.

To solve this problem some PLCs can be custom programmed in C computer language. Some companies boast of their “proven library of control functions”. This is nothing more than packaging a control function into a block. This approach solves a lot of the problems of ladder logic but most manufacturers consider this proprietary information and the customer is left with no information on what is happening inside the block. This seems to defeat the purpose of the “open” control system they advertise.

TDS has developed control loops. This approach allows for the development of self contained control loops on one “sheet”. The user can see what a particular piece of logic is trying to do, from beginning to end on one page. The system is programmed using SAMA logic like blocks or custom blocks where appropriate. This allows for very easy troubleshooting. The blocks perform very simple control functions like rate limiters, PID blocks, MAX select blocks, etc. Some blocks have no SAMA logic equivalent such as I/O communication blocks. These blocks are not self-explanatory because there is no standard but are thoroughly documented in the application manuals. More sophisticated control schemes are also pre-packaged in this way to simplify control system logic. This simplifies control loop programming because the user is not trying to create all these functions every time.

HMI’s from other vendors are typically built using one of the available off-the-shelf HMI packages on PC platforms. They all advertise how easy and great their graphics are when in reality they are ALL using the same program. These programs all advertise their feature-rich interfaces. What they do not tell you is that these feature-rich interfaces come at a price: complexity. These interfaces are far too complex and overkill for the average power plant HMI. They were built by programmers for programmers as evidenced in the abundant use of Visual Basic for graphic programming. TDS has taken the approach that a simple and easy to understand HMI is the right HMI. What good is an HMI program if no one in your plant can program it? Complex interfaces are also an avenue for errors. In addition, these programs are all Windows based.

Windows has developed a reputation for being unreliable and needing frequent reboots. From the users perspective any reboot is untimely especially if a turbine startup is occurring. TDS HMIs have never been rebooted once due to software after being placed into service.

In summary, while other vendors hide under PLCs for their control systems, TDS has the expertise and resources to truly bring a revolutionary control system to market. Most other companies are just repackaging PLCs along with their limitations under their own names.