Matrix International (UK) LTD.

Engineering Methodologies & Services

Rigourous Engineering design, Development & Consultancy

Contents

1 Our Philosophy

At Matrix we pride ourselves on transparency. This extends to our Engineering procedures. We want our customers to have ownership of our systems and be able to support them seamlessly and easily internally.

Exactly how our systems are structured and the tools which aid their maintence seemlessly are made freely available with every installation.

Furthermore, explicit Engineering structures and Quantiative documentation allows computer programs to be written to aid the maintence operations and seamlessly integrate with software systems through inbuilt API's as required by the customer.

2 Standards

2.1 Machine Regulations

2.2 ISO 9001

2.3 Internal Standards

3 Management of Engineering Projects

Underlying Princple : For maximised efficency when project managing - beyond the necessary safety considerations and maintaining a strong understanding of what the customer requires and expects - Engineering tasks should be itemised as much as possible.

By itemising and planning each Engineering task, concurrency and parrallelised execution of tasks can be planned allowing more time for testing robustness and developing maintenance strategies for our control systems.

Furthermore, consistant updating of the project management model means cheaper and faster implementations for similar sets of systems over time.

What this means for customers : With every single Control System, Matrix provides a slew of maintenece method statements which is likely to cover most issues. Often, training in industry is more of a qualitative explanation of how the system works, rather than a quantitative set of solutions to real problems which may arise. Matrix is able to provide such due to the rigour of the project management model and experience within the field. For Matrix, the project is not finished until the control system is ultimately decommisioned.

Furthermore, explicit project plans allows the customer to know exactly how Matrix shall operate - enabling greater transparency and planning on their side.

4 Process Engineering Specification & Analysis

Underlying Principle : Any process can be represented as a set of classical mechanical properties actuating through space & time.

Examples of commonly employed physical properties in the industrial context include:

Position, Velocity, Acceleration, Angular Position, Angular Velocity, Angular Acceleration, Temprature, Rate of Change of Temprature, Pressure, Rate of Change of Temprature, Viscosity, Volume, Density, Flow rate by mass, Flow rate by volume, Inductance, Irradiance, Frequency, Wavelength, Thermal Conductivity and so on.

In any particular process, some set of these properties are actuated. Where actuated directly, an actuator is specified it is done so alongside a physical transfer function. Where actuated indirectly, an actuator is specified with multiple physical transfer functions via proxy properties consolidated into one transfer function.

Where actuating incidentally, for example the temprature may increase incidentally to pressure but temprature may not be an important process value, said property is still engineered and analysed for safety and plant simulation purposes.

What this means for customers : What a system shall do, should be explicitly, quantitatively documented and simulated. Knowing this allows the customer to recieve analysis data with respect to how effectively the system operates, evaluating its observability and controllability as well as making important decisions about process design and modifications with ease.

5 Mechanical Engineering Specification & Analysis

Underlying Principle : Before being able to design a system to control any particular plant, how each mechanical actuator converts Electrical Power to hence manipulate the process properties must be specified for purpose of control.

For instance, a motor converts Electrical Power into Torque, which hence changes position which, in this example, is the process property. It does so via a Conveyor, which is represented by the transfer function described under the Process Engineering taxonomy. The Motor then has its own transfer function which represents the way it converts Power into Torque which should be specified for purpose of control.

For instance, the position of the conveyor, a CAD model for the whole plant, a floor plan and a P&ID diagram are among some of the specifications we provide.

What this means for customers : Controlling systems properly ensures customers the system has been Engineered properly, rather than developed via technique. Doing so makes all aspects of the Project lifecycle easier, from accuracy of control, efficency of commissioning to long term maintainence.

6 Electrical Power and Control Systems

Underlying Principle : Industrial Control Systems use Electrical Power to actuate most of the actuators. Exceptions include purely pnuematic systems, mechanically operated mechaniary and peripherals such as fork lifts. Electrical supply, conversion, control and documentation is hence paramount.

Matrix designs and simulates electrical systems within the functional control loop. Conversion and supply of power is preformed in the most efficient way possible with multiple different methods compared.

Matrix ensures standards are adhered to, especially when dealing with high power systems.

What this means for customers : Electrical systems which are designed properly ensure long lasting components and reduction in power cost where conversion is preformed via non-lossy methods where possible.

7 Control System & Sensors

Underlying Principle : Controlling a system should be done in a calcualted and engineered fashion via a control loop.

Matrix explicitly defines control loops when designing a system, exactly which sensors govern which actuation is hence clear - making what may be difficult debugging issues seamless and control systems which work out of the box with little adjustments.

What this means for customers : Easy to maintain systems, clearly documentated and Code which makes clear and obvious sense rather than being cryptic & structred arbritraily.

8 SCADA Systems & PC Based Controls

Underlying Principle :Analysis, tracking, control and automated management & maintence of industrial systems via computer systems integrated seamlessly.

The above Engineering model provides interoperabile data which can be seamlessly converted accross to a PC hardware based distributed control system rather than a PLC- wheter for computational speed on a PC or the networking advantages.

What this means for customers : SCADA and PC based systems seamlessly integrated with the whole Engineering stack, using the correct technology for the use case. Extendability to any analysis platform or workflow with ease.