Consultation, Design and Build - Control and Instrumentation

JK CONTROLS LIMITED

Welcome to *JK Controls Ltd*

Control system and instrumentation specialists.

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Introduction to *JK Controls Ltd*

With the reducing cost of functionality available from modern equipment, control systems are becoming ever more versatile. JK Controls engineers have the experience to exploit these attributes to advantage.

Our professional engineers have been working for many years at the forefront of complex control and instrumentation applications for major industrial users in the commercial, utility and environmental sectors. Our breadth of experience allows us to engineer the optimum solution for your control requirements and can help make your plant operate more flexibly and more effectively.

All our work is customised to the needs of the plant and the economics of the owner. We are in the unique position of being able to not only design and procure your systems and equipment but also have the in house capability to manufacture special instrumentation and interfaces to cope with unusual, difficult, or non-standard situations.

JK Controls are committed to providing a high quality service with attention to detail, safety and cost.

SCOPE

Analogue Controls, Relay Logic.
Control Systems Architecture.
DCS, PLC AND SCADA.
Feasibility Studies, Functional Design Specifications, Technical Writing.
Linear Displacement Measurement.
Panel Manufacture and equipment integration.
PCB Prototyping.
Plant instrumentation.
River Level Regulation.
Special (bespoke) instrumentation and interfaces.
Test Rig Build and Data Collection.
Utility Boiler Controls, feed load, fuel, level, temperature, de-superheat.
Upgrading and retrofitting obsolete electronic equipment.

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System Integration

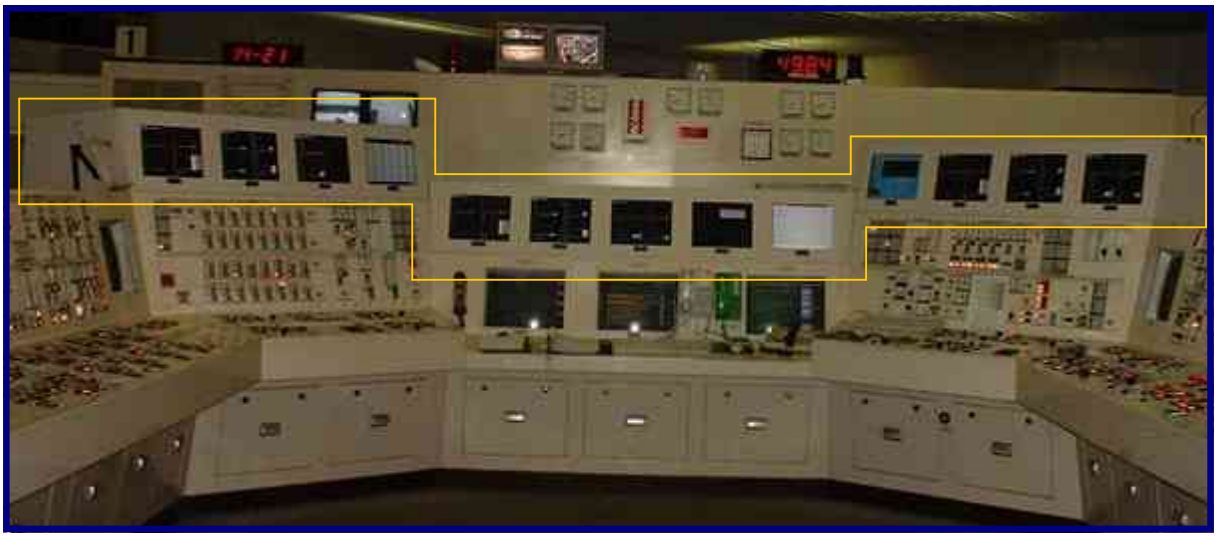
Our services range from specification on behalf of the Client through to taking on a turnkey project to design, supply and commission. We are not tied to a specific manufacturers product, which provides a flexible choice of SCADA, PLC and HMI equipment in our recommendations to Clients.

JK Controls has a great many years of experience in industrial control systems, instrumentation and process control system design and realization. Most of this experience has been obtained in the utilities sector.

As system integrators every project is designed to our customer needs and is therefore unique. Consequently we can only give examples of previous projects as a guide to our wide field of experience and capability.

Display Systems

Replacement of paper chart recorders by visual displays to reduce maintenance burden. Plant signals are collected by PLC input modules and the data then transmitted by Ethernet communications to an array of Microsoft Windows based PC's, each with multiple LCD displays. Software written to enable the plant operator to select any trend display and its' history. Control desk enhanced by tailored extension pods to house the displays.



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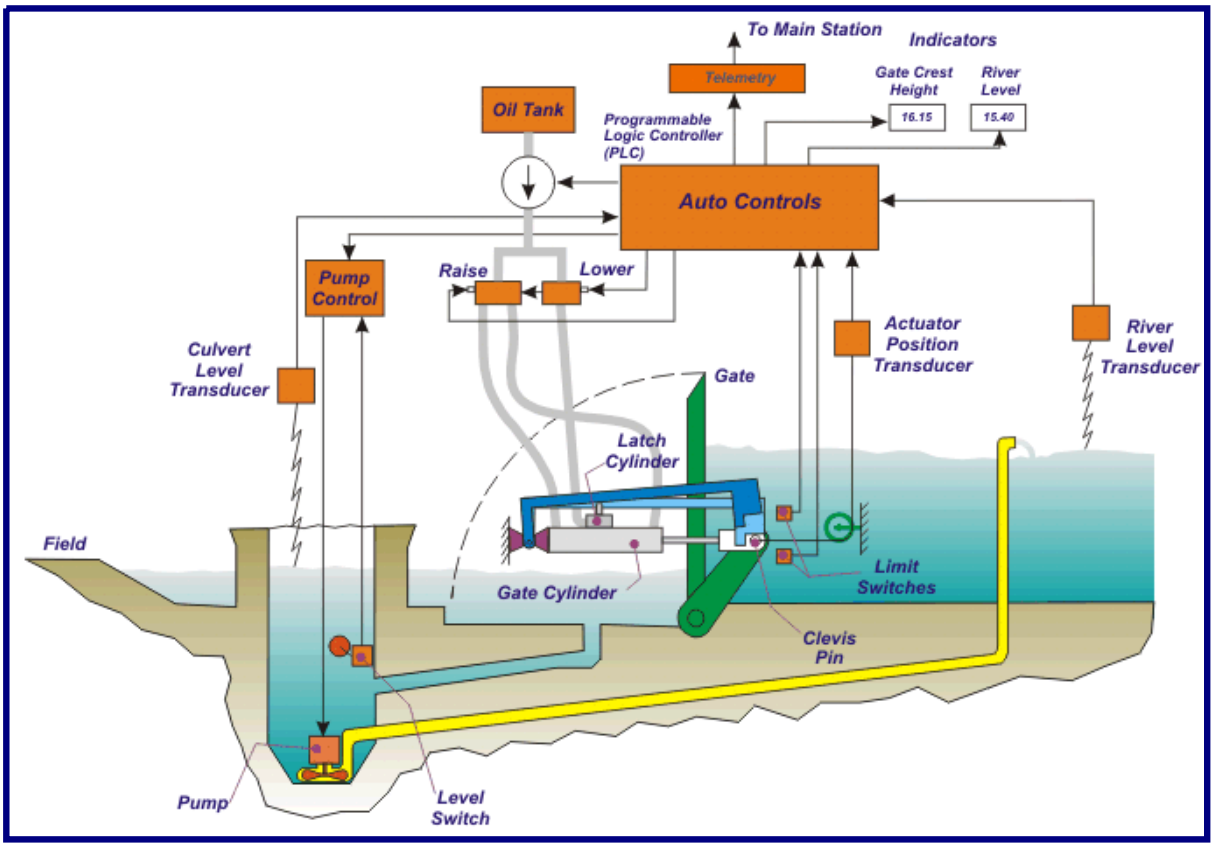
Flood Relief

For small systems we make use of Human Machine Interface (HMI) equipment for use with a programmable logic controller (PLC), for example, river level control.

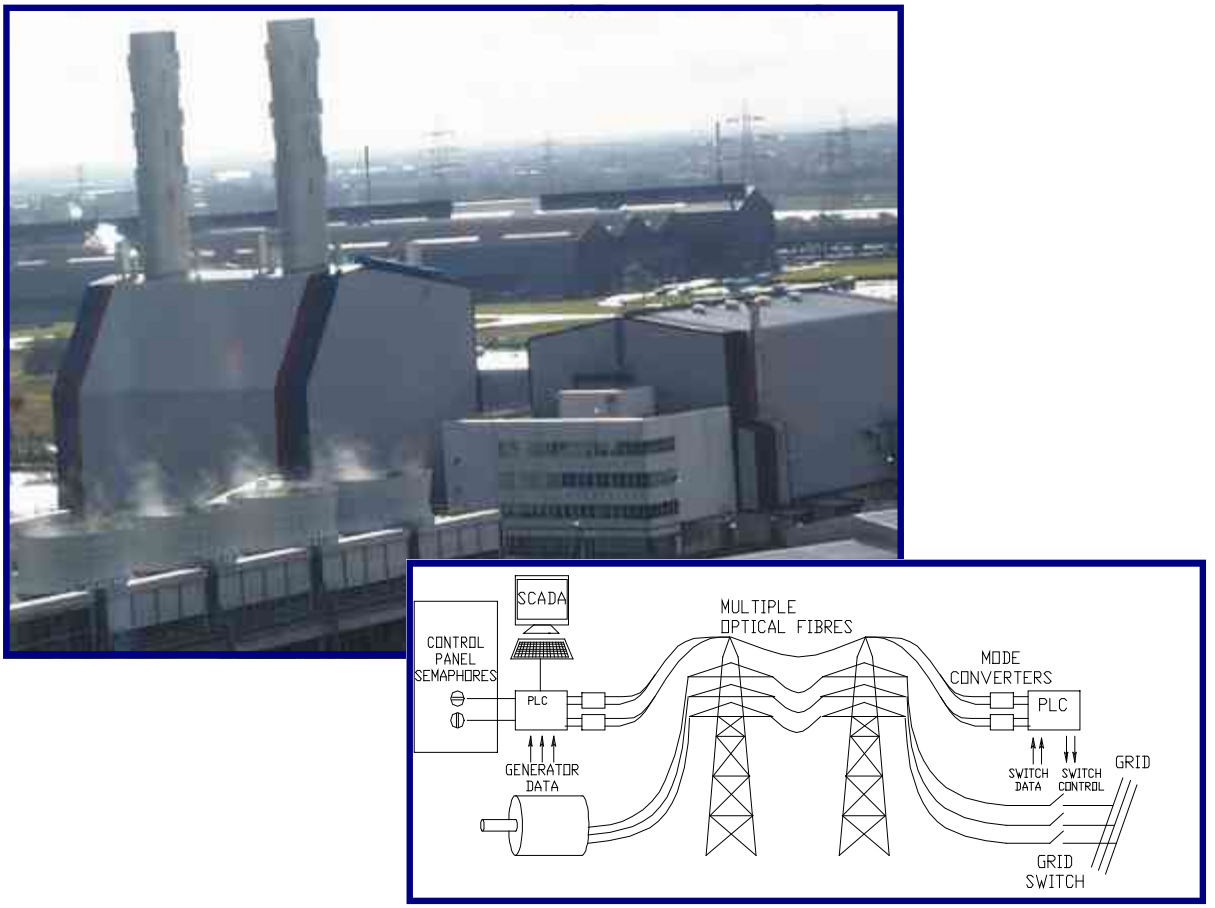


A hydraulically actuated side weir for a river to relieve excess flood water to a flood plain.

The hinged gate is normally latched closed, but will open proportionally to maintain a constant water level in the river. The control system modulates the gate position when needed and also periodically flushes the culvert to prevent stagnation. The culvert minimum level is also maintained to avoid drying out. The status of the water levels, gate position and system alarms are relayed by telemetry to the client's remote control centre.

Grid Switching

We have provided remote control of 400kV grid system switchgear using a SCADA system and PLCs.



At a combined cycle gas turbine power station JK Controls designed and installed a SCADA system to operate remote power breakers over a 2 km fibre optic cable using dual optical pairs for the secure data transmission between local and remote areas.

Data is gathered by a PLC which operates the breakers via multiple redundant outputs. The operator interfaces with the system via a windows based PC with built in security procedures to reduce the risk of mal-operation. The software is configured to self test the controllers and fail to a safe condition.

Multiple Penstock Control of River Level

In this application there are six vertical lift penstock gates set across the river to automatically control the upstream level. The six gates, each with its own electric actuator, are modulated in sequence by a PLC .

The control system maintains the upstream river level within +/- 50 mm. The system has many special features including the following:

Local control via HMI,
Remote control from flood defence office via PSTN telephony.
Gates can be individually selected to Manual / Auto / Remote, and operated from central office computer systems.
Any gates can be moved on manual demand from Remote or Local locations.
Techniques to allow for time delays in PSTN when in Remote control.
In Auto, gates open & close in a priority order.
Priority order can be changed remotely, to distribute mechanical wear.
Automatic resolution of conflict when priority is changed.
Seamless transfer to new priority.
Gate opening increment varies according to gate height, (High flow effect at small openings).
When gate is clear of water surface gate continues to 100%.
Several level deadbands and rate of change used to cope with flash floods.
Obstruction by debris is detected, gate stops and control moves to next gate in priority.
Gate obstruction alarmed to central office.
Obstruction limit release on reversal.
Intruder detection and personnel time limits at site monitored and alarmed.
Alarm to office when bypass gates need opening or closing.
Software filters to minimize interference.
Detection and alarming of implausible gate and river measurements.

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Consultancy

Our professional control engineering consultancy team can undertake a range of support services applied to control, measurement and testing needs.

We carry out feasibility studies to determine if and how improved controls will benefit our client. We write functional design specifications, carry out vendor assessment and selection, undertake detail manufacturing design of systems, installation supervision and commissioning. Our engineers have carried out due diligence and remnant life surveys on industrial plant, in strictest confidence, with non-disclosure agreements if required.

Methanol Plant—Saudi Arabia

Current status and life assessment of controls and instrumentation on methanol production and water treatment plants with recommendations for maintenance, replacement and future improvements to control systems.

Power Plant

Due diligence investigation and reporting of Control and Instrumentation in power stations for prospective purchasers of the plant.

Supervision of maintenance companies for water and electricity authority in Abu Dhabi.

Supervision of installation contractors for combined heat and power plant in Turkey.

Design of boiler controls for large coal and oil fired power generation plant in the UK, China and USA.

Industrial Fire Damage—Holland

Assessment of fire damage for insurance claim.

Expert Witness

Technical advice for legal claim.

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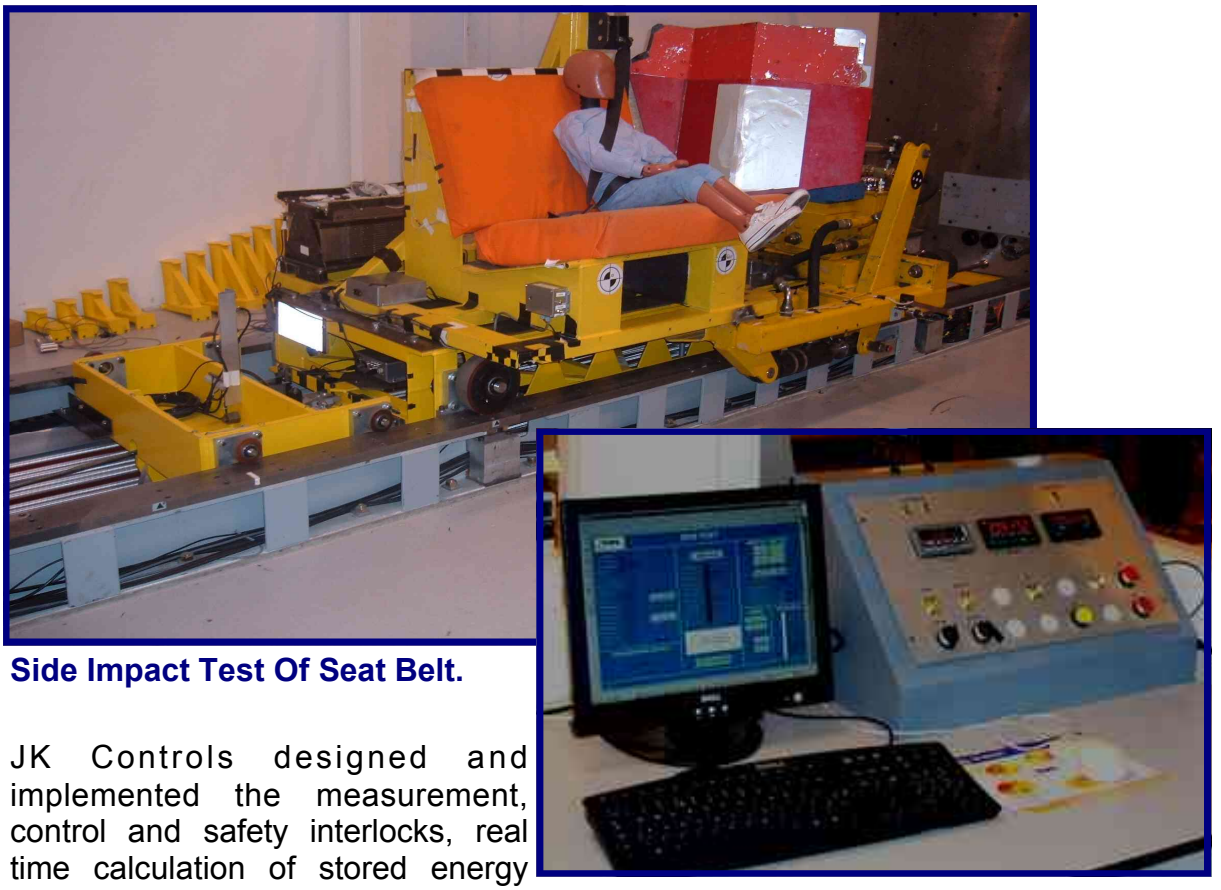
Research and Test

We can fulfil all aspects of engineering test rig design and construction, tailoring test apparatus, controller and data capture solutions to your needs. We can undertake any individual aspect of the research problem or provide a complete test facility.

JK Controls design and build electronic test equipment, programme computer software and produce custom interfaces for test systems.

Road Vehicle Component Crash Test Facility



Side Impact Test Of Seat Belt.

JK Controls designed and implemented the measurement, control and safety interlocks, real time calculation of stored energy and estimated impact velocity. Our design utilised a laser for high speed capture of position, depth of impact and control of vehicle rebound breaking.

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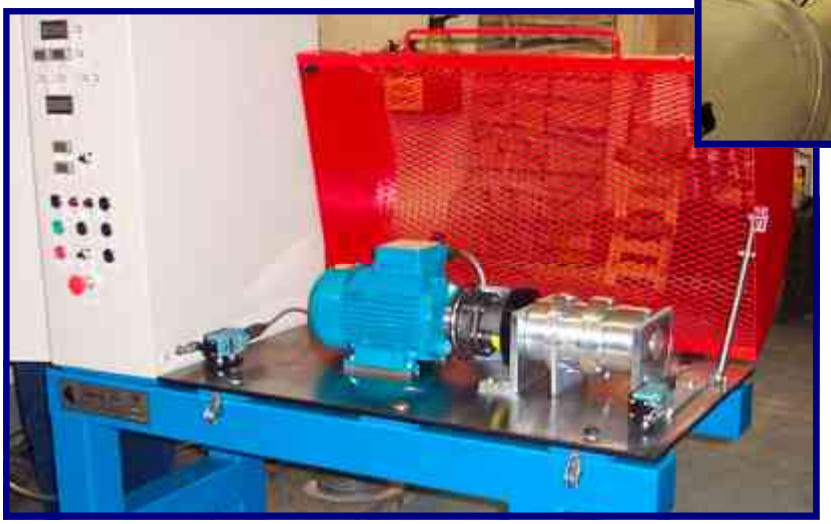
Aircraft Wing Brake Test Stand

Dynamic performance of commercial aircraft wing aileron shaft brake. Automatic control of test sequence and measurement of deceleration, time to stop, breaking torque and peak torque. This entailed the development of custom instrumentation and electronics to achieve the superior dynamic performance required during rapid deceleration.



Cable Wrapper Speed Analysis

To measure deceleration of cable insulation winding heads, JK Controls designed and manufactured high resolution transducer and signal conditioning equipment to determine linearity of speed change.

Jet Engine Test Cell Environment

JK Controls designed and produced the environmental controls of an engine test cell. Temperatures were regulated to achieve the very low air temperature experienced by jet engines at high altitude.

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Combating Obsolescence

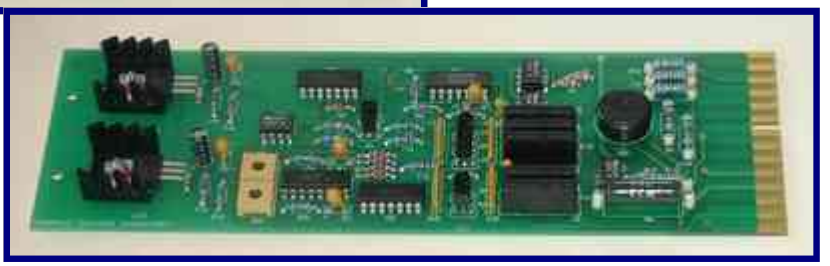
Rising costs, increasing legislation and obsolescence in industry may require upgrading older control and instrumentation systems. This is not always financially viable. JK Controls engineers have the skills to provide the most cost effective method of upgrading and retrofitting existing and obsolete automation equipment.

We support established industries, such as power generation and water infrastructure, applying our knowledge, modern techniques and equipment, to help remedy otherwise intractable problems of automation obsolescence in these long lived plants.

Replacement Alarm Cards

Original Alarm Card

New Plug Compatible Alarm Card



A power station's ageing alarm system had become obsolete due to the original manufacturer no longer being in business. JK Controls provided a cost effective solution by analysing the existing system and then designing and building new solid-state based circuit boards to electrically emulate and be physically plug compatible with the original. This removed the need for full system renewal or a protracted safety case review, saving considerable cost and plant outage.

Interfacing

Older equipment may have non-standard interfaces to modern control devices. JK Controls have designed and built interfaces to integrate pulse / stepper / analogue inputs and outputs between transmitters, controller and actuators.

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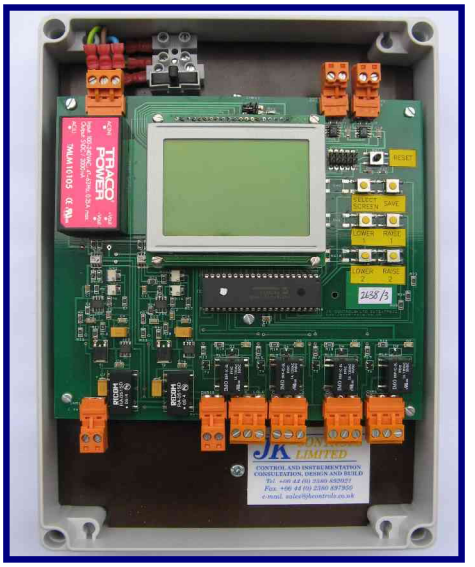
Custom Electronics

Our engineers are skilled in production of bespoke instrumentation. We design electronic circuitry to a customers specification, produce prototypes and manufacture in low volumes.

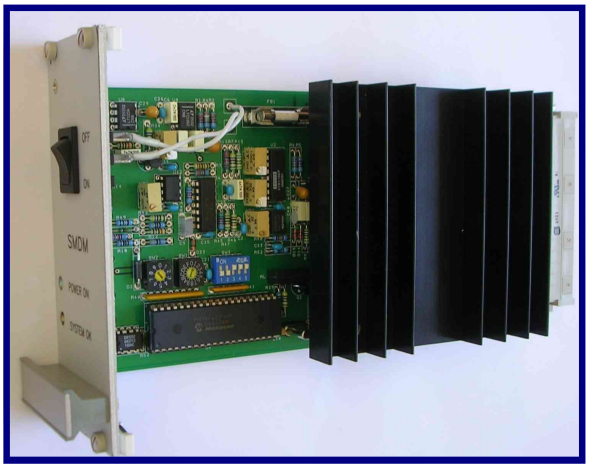
Customer requirements for this service are extremely varied and hence difficult to quantify. Therefore if you have a need for special instrumentation, measuring or interface devices please contact us, we always like to tackle something different.

Drum Level Controller



We developed custom instrumentation to measure the position of the water/steam interface in high pressure boiler steam drums for use in a Power Station. Characteristics of steam tables to compensate for steam density changes were emulated using a microcontroller. The controllers comprised two differential 4-20mA analogue inputs, one for steam pressure (1-201 BarA), the other for differential pressure (0-125 mBar). Outputs consisting of duplicate, isolated, 4-20mA analogue signals provide the drum water level, ranging from –580 to +430 mm, along with four alarm output relays. An LCD displays I/O and alarm status. Alarm Level and hysteresis settings are adjusted via pushbuttons.

Stepper Motor Drive Board



A modern DCS with analogue output needed to interface with plant actuators that have stepper motor driver pilot position inputs. Our design positions the pilot to within 0.1% and has built in protection to fix the actuator at last valid position on loss of DCS signals. Other features include variable speed and acceleration plus adjustable deadband.

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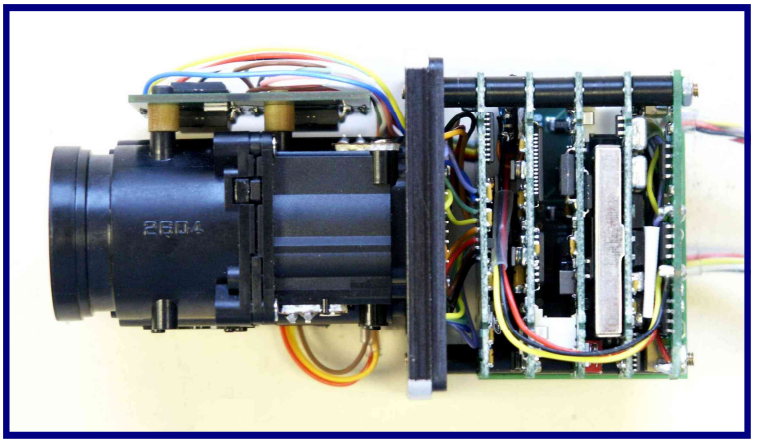
Remote Inspection Camera Systems

For very low light inspection inside closed vessels JK Controls engineers have developed a multi frame scanning camera system which integrates very low light images to bring the final image to a level which will permit observation of detail for inspection. The cameras are encased to allow remote use in harsh industrial environments, such as reactors. The images are displayed on bespoke operator consoles and recorded for quality and record keeping purposes.



Camera Fitted with Camcorder Zoom

Camera Control Consoles

A power plant company use many specialist techniques for plant inspections during overhaul periods. One need was for an operator console to house the controls and monitors. JK Controls built a pair of custom consoles that could vary the lighting and monitor the temperatures of the cameras and their physical inclination within the plant. Horizontal shift of camera could also be altered remotely to adjust the stereoscopic imaging.

JK Controls have also built bespoke control consoles for video display, recording and camera monitoring.

Inside Typical Console

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The *JK Position Sensor*

At JK Controls we manufacture a range of low cost linear position transducers. These provide linear measurement of the movement of a valve, actuator, damper or any moving device and provide a current, voltage or resistive feedback signal proportional to position.

The transmitter uses a rotary potentiometer as the variable element. A non-stretch coated steel wire is wound onto a pulley wheel with a constant force spring arrangement for cord retraction. The end of the cord is fitted with a split ring for attachment to the client's equipment and a swivel prevents the cord from twisting. The cord passes into the housing via a ceramic bush which resists wear and allows considerable miss-alignment, up to 30 degrees off centre.

Standard Position Sensor
Measuring Range: 35 to 1250mm

We also manufacture a compatible electronic card which can be mounted within the transducer housing or in its own remote mounted housing. This card allows transmission of industry standard 4-20mA loop powered 2 wire signal to remote processing equipment. The card has span and zero adjustment for local calibration of the loop. Various plug and socket options are available for the electrical connections.

Our range of Position Sensors have provided the ideal, cost effective answer in a variety of situations where linear displacement is difficult to measure, for example, where high vibration or misalignment is a problem, or where long stroke actuators are required at low cost.

In many instances we have modified our transducers to adapt them to a client's specific application. For example, providing mounting brackets, pulleys, extended pull wires, plugs and sockets, terminal housings, float or displacer attachment for liquid level, all at minimal cost.

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Telescopic Position Sensor—Tilting Gate Weir

Our telescopic linear position transducer has been used for hydraulic actuator position measurement of a tilting weir gate across a river.

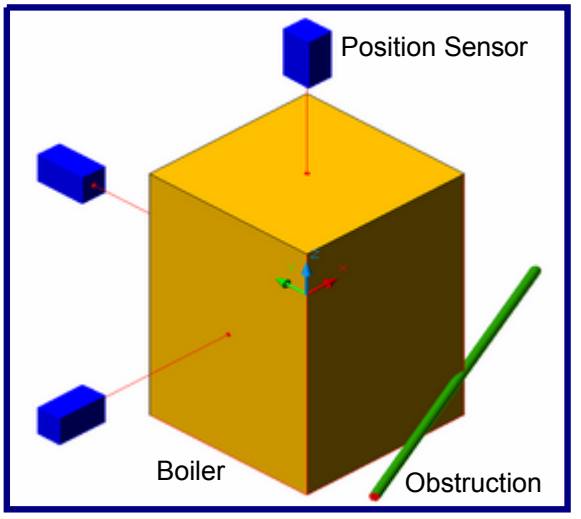
Telescopic Position Sensor Measuring Range: Up to 2 meters.

Standard Position Sensor—Bridge Movement

Our linear position transducers have been used in the civil engineering profession for measuring the movement of structures. During the Channel Tunnel Rail Link construction project thirty one Position Sensors were used to measure the relative positions of a bridge and its piles as the bridge required jacking up to realign its height.

Standard Position Sensors—Boiler Movement

A power station experienced rogue disturbance to boiler pipes and pipe hangers. Our linear position transducers were fitted at several points around the boiler to determine the directions of expansion where boiler temperature changed. Triangulation of the differences between the theoretical expansion and the actual movement identified a point where the natural boiler movement was constrained.



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