



The Newsletter of FKI Rotating Machines Division

PART OF THE  FKI GROUP OF COMPANIES

# Quality – our core competence

Welcome to the second FKI Rotating Machines Division newsletter. In this issue I would like to show you some of the investments that FKI is making to ensure the quality of the products we supply meets our customers' high expectations. Such investments come in a variety of shapes and sizes: we have bought new machine tools to make products more accurately and more repeatably; we have improved test facilities to check product conformity; we have trained staff in quality tools like Statistical Process Control and Six Sigma; we have redesigned products to build in quality rather than test out faults.

Many of these improvements have had added benefits such as reducing rework, reducing failure on test and improving product reliability in the field. These savings offset the costs of the investments we have made, so that we can offer our customers

products with the lowest cost of ownership in the industry.

These efforts have been assessed and recognised by external bodies. All our manufacturing units are certified as compliant with ISO9001 by the relevant national body. Other approvals include EECs (for hazardous area equipment), TickIT (for software), Ford "Q1" preferred supplier, and IIP (for staff training and development).

Though not strictly within the subject of "quality" you might also like to know that ISO14001 is being implemented across the Division, with Marelli and Froude having already achieved certification. ISO14001 relates to the impact a business makes on the environment, particularly with regard to the emission of pollutants and the use of natural resources like paper and water. Only by carefully controlling our processes can we achieve the

required standards, and thereby further improve the "quality" of our businesses.

Lastly, there is the very important issue of the quality of our people. FKI Rotating Machines believes it is not possible to achieve the product quality we desire without having staff of a suitable calibre trained and motivated to achieve the best results. We have a number of programmes operating at all levels of the organisation: in this newsletter there are articles on two of these programmes, the FKI Graduate scheme and the FKI Engineering Group management development scheme.

Reg Gott –  
Managing Director, FKI Rotating Machines Division

## Production

# New Floor Borer improves accuracy

In the pursuit of higher quality and efficiency of production, the machining capabilities of Brush Electrical Machines have undergone a major upgrade and renewal programme lasting over 2 years and costing more than £3 million.

Work began on the operation during 1997 when it was decided that a reorganisation of the two current machining shops would bring substantial benefits. A streamlined system of working, eliminating avoidable handling of work in progress and reduction of floor space used by up to 30% were the major objectives of the project. These would lead to improved quality and a reduction in time-critical elements of production.

In addition to reorganising and re-siting existing machinery, an important addition to the machine shop capabilities was provided with the addition of a Horizontal Ram Floor Borer. This important new piece of equipment, customised to BEM's requirements and representing over £1million of investment by itself, is the centrepiece of the new machine shop. The addition of this piece of equipment had been contemplated for

several years, before the FKI group gave permission to proceed following their acquisition of the company.

Manufactured by Czech company Skoda, the borer incorporates a Heidenhain 430 CNC controller and is 25 metres long with a travel length of 14.5 metres and a 3.5m<sup>2</sup> rotary table. A maximum height of 3.8m and a ram reach of 2m can also be attained. The machine has been calibrated to give a radial accuracy of 13 microns in a 600mm-diameter test, which is the size of a standard turbine/generator interface.

The new borer replaces four existing machine tools, thereby eliminating the transfer of work between machines for boring, drilling and tapping operations previously necessary. Floor to floor times for stator frames has been reduced by a factor of five. In addition, avoiding the extra steps eliminates any alignment error between machine tools, significantly improving the overall machining tolerances achieved. Efficiency is further enhanced by the ability to set up jobs on one part of the machine whilst it is carrying out operations on another.

The borer has added an extra dimension to the quality and consistency achievable for machining of BEM's range of products, and will ensure that the commitment to quality of the FKI group is upheld.



New floor borer machining a DAX turbo generator stator frame

## People

# Management Development Scheme

FKI has established a management development scheme that provides formal training to young managers with the potential and aspiration for more senior positions. The programme runs for two years based around a series of modules on topics such as finance, marketing and operations management. When all modules have been completed (and the exams passed!) the participant receives a Diploma in Management. The academic content and administration of the course is provided by Loughborough University Business School, recently ranked in the top ten UK business schools for quality of teaching.

There are currently about twenty participants in the scheme, more than half of whom come from Rotating Machines Division companies. As the Division rises to the challenge of the rapidly changing business environment of the twenty-first century, these participants will provide the professional management that the company needs to grow and prosper.

# FKI Graduate Intake of 2000

On 11th September 21 newly graduated engineers began their two year participation in the FKI graduate Development Programme. They join the 70 others who are currently on the scheme or who have already finished their training.

The FKI Graduate Programme has been put in place to ensure that FKI companies have a continuous flow of talented engineers with new ideas progressing through the group. To ensure the quality of this talent, a broad and rigorous programme has been developed that encompasses all engineering disciplines, as well as issues like contract law, sales & marketing, finance and people management. The programme is structured into a series of six month placements combined with formal, out-of-company, training sessions. All graduates have

at least one overseas placement in a business whose language is not their mother tongue, and they are provided with language training to support their integration into the business.

The scheme is accredited by both the IMechE (Institution of Mechanical Engineers) and IEE (Institution of Electrical Engineers): graduates who complete the course are qualified to join the relevant Institution as an associate member. Upon completion of two further years of experience in a suitable industrial sector they are entitled to become a full member, and achieve the status of Chartered Engineer (CEng), Professional Engineer (PE) or European Engineer (EurEng). Graduates from a number of nationalities are included and other engineering body training requirements are addressed.

All companies in the Rotating Machines Division participate in the FKI Graduate Programme, and several now have graduates who have completed the programme as full time employees. Once graduates have completed the first two years, they may continue their studies to achieve an MBA in a follow-on FKI programme run in conjunction with Hull University.

FKI graduate intake of 2000



## Systems

# FID plans migration to ISO 9000:2000

FKI Industrial Drives gained accreditation for ISO 9001 from BSI in 1998. The ISO standard used was that issued in 1996 and is the current version used world-wide. A new ISO 9000 version is expected shortly, and will be called ISO9000:2000. FID believes it is well placed to achieve the migration to the new standard.

ISO9000:2000 differs from previous versions in that it focuses on 4 major elements instead of a previous 20, these being:

- Management responsibility
- Resources management
- Processes
- Measurement, analysis and improvement

The aim is to increase the focus on top management commitment, customer satisfaction and continual improvement. This will be achieved by applying eight quality management principles:

- A Customer focused organisation,
- Leadership,
- Involvement in people,

- Process approach,
- System approach to management,
- Continual improvement,
- Factual approach to decision making and
- Mutually beneficial supplier relationships.

The new standard, which has just been issued as a Final Draft International Standard (FDIS 14/9/00), could be fully issued by December 2000 pending its approval by the various national institutes. More details can be obtained from the ISO web site at [www.iso.ch](http://www.iso.ch).

Through a policy of training and continuous improvement FID has been able to improve the working procedures and processes to ensure the people and the systems are moving forward with the needs of the business. In addition the focus on 'performance measures' has helped to highlight areas of the company that need improvement. These activities are very much part of the ISO9000:2000 processes and FID is anticipating migrating to the new standard during 2001.

# Froude achieves software quality award



Brian Hemstock, Managing Director of Froude Consine, receiving the TickIT certificate from Paul Whitticker of the British Standards Institution.

TickIT is the recognised extension to ISO9001 to cover software quality. The standard looks not only at the quality of the code itself, but also at the support environment such as back-up, version control and archiving, ensuring best practice is used in its generation and implementation.

The control systems supplied by Froude to support the dynamometer hardware are software dependant and critical to the

testing programmes of many automotive and engine research facilities.

There are two principle areas of software; the embedded code in the high-speed control and data acquisition hardware, and the data analysis and presentation user interface that is largely PC based.

Through the use of innovative design and development, within the guidelines of TickIt, the software written by Froude's staff is of the highest quality.

# Precise Measurement at LSE



LSE's new calibration room

and combined Gear Metrology and Programmable Co-ordinate Measuring Machine facilities.

The temperature and humidity controlled Calibration Room houses all the equipment necessary to calibrate the whole range of electrical and mechanical measuring and test equipment utilised throughout the company. The inventory of equipment contains well over 4,000 items that are subject to periodic calibration, managed via a computerised recall and record system.

The specialist equipment available in the Gear Metrology section enables the gears, worms and wormwheels manufactured to be accurately measured, this being critical to the successful build and operation of the range of gearboxes produced.

Further, in support of this product range and other components with close geometrical tolerances, a 3 dimensional Co-ordinate Measuring Machine, with an envelope of 1200 x 850 x 850 mm, has recently been acquired. This machine, which is fitted with the latest windows based software, is fully programmable in all 3 axis and has an accuracy over its envelope of  $\pm 3$  microns.

The provision of all these facilities enables the accuracy and certainty of measurement within the company to be guaranteed, additionally providing the ability to continually monitor production output for conformance to specification, essential to the range of precision products manufactured by the company.

LSE has operated certified quality systems since 1973 when it was awarded certificate No 8 by the then Central Electricity Generating Board for compliance with their Quality Standard 42/1.

A highly visible demonstration of the Company's ongoing commitment to quality has been the recent establishment of a centralised quality assurance department, housing the QA office, Calibration Room

## New Test Bay at HMA Power Systems

To meet the stringent requirements of customers' expectations for large machine performance, HMA is installing a new test bed. The photo shows the sole plates of the test bed being aligned before casting into the foundation next to the existing test facility. Once the bed is completed a new sound enclosure will be installed over it to ensure that noise levels in the assembly hall are kept well below safety limits.

Along with the new test bed, new measurement equipment is being installed to collect and record data automatically during the testing process. A sophisticated power meter has been acquired capable of highly accurate power and harmonic measurements and analysis. The power meter also includes data logging facilities which facilitate the accurate recording of quality test data under a variety of operating conditions.



Work in progress on HMA's new test bed

## Production

### Automated press shop at LSE improves lamination quality

Essential to the successful manufacture and function of rotating electrical machines is the consistent quality of stator and rotor core packs. Accurate, burr free, production of the 500 to 1000 laminations required for a motor minimises iron and electrical losses and prevents damage to coil insulation during the winding process essential to the use of VPI systems.

To address this requirement LSE has established a "Centre of Excellence" for the manufacture of circular laminations, which came into operation in the autumn of 1999. This new facility involved the installation of 5 Weingarten notching machines linked by bespoke pick and place robots in a newly constructed workshop. The line can produce stator and rotor laminations up to a maximum diameter of 1.25 m, with an

annual throughput of over 800,000 parts.

The line circles the electrical steel plates and pick and place robots feed the notching workstations, which are driven by servomotors having a positional accuracy of 1/1000 of a degree. The fully automated process is equipped with touch screen programming with CCTV monitoring from a centralised control room. All material off-cuts resulting from the process are removed via an underfloor conveyor system and the whole operation is enclosed by interlocked guards to prevent unauthorised access when the plant is in operation.

The complete unit was installed and commissioned at the cost of over £300K, providing a facility that produces laminations which, when assembled into core packs, have the quality characteristics essential for a world class product.



Marelli's VPI plant in operation

## Marelli installs state-of-the-art VPI Facility

MarelliMotori's new Vacuum Pressure Impregnation (VPI) plant is one of the most modern in operation across Europe for the types of machine made at Marelli. With the addition of this new facility the impregnation process is completely automated and has achieved significant improvements in quality, including:

- The whole vacuum-pressure cycle is controlled automatically ensuring consistency from batch to batch,

- Complete control and continual monitoring of all process parameters (time, temperature, pressure and resin characteristics),
- The ability use the same VPI process on all Marelli products,
- Larger, more consistent quantity of resin impregnated into the windings, to improve insulation and mechanical strength,
- Reduction of the waste polymerised resin,
- The reduction in solvent pollutants per unit product,
- Energy savings due to a reduction in thermal losses.

The VPI investment has facilitated a significant improvement in the quality of this fundamental process and has also allowed a reduction in the environmental impacts both internal and external to the factory. The environmental and quality improvements achieved with the introduction of the VPI plant have set a benchmark against which all future investments will be compared.

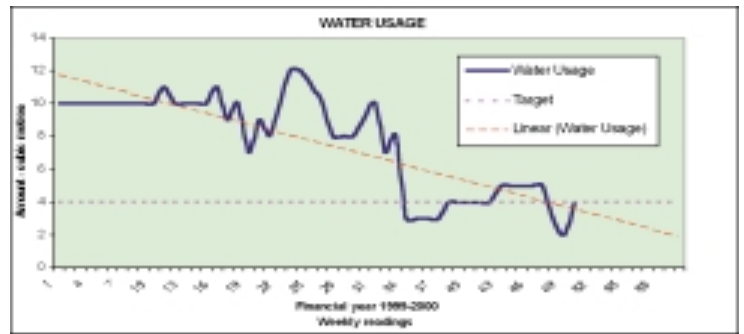
## Environment

# Protecting the Environment at Froude

Froude Consine in Worcester, UK, achieved accreditation to ISO 14001 just over a year ago. ISO 14001 requires the company to minimise its environmental impact on the local community, the company and its employees.

A typical example is the structured waste minimisation programme introduced by Froude Consine to control the usage of water within the total site facility. The chart demonstrates the reduction from 10 cubic metres per week to 4 cubic metres per week over a 30 week period, with consequential financial savings.

Waste minimisation programmes on electricity, gas, paper, fuel, compressed air and volatile organic compounds have also been implemented with successful results.



## Certificates



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