



Production boosted for CLS

Design and build booster synchrotron dispatched from Danfysik

In just 20 months since the contract was awarded to Danfysik, the Canadian Light Source full energy booster synchrotron is now being installed in Saskatoon.



CLS booster at the Danfysik factory prior to shipment

In order to fulfill this contract there has been significant expansion at the main Danfysik factory in Jyllinge near Copenhagen in Denmark. The factory space has been increased by some 35%.

To meet the demands for this and to cover a general growth in activities, the staff at Danfysik has been increased with an additional 6 engineers and 15 skilled technicians.

The technical headlines for this project are: ● 2.9 GeV booster synchrotron ● FODO lattice design ● 20 bending magnets ● 28 quadrupole magnets and 22 correctors ● RF system included within the project responsibilities ● All magnet power supplies feature an arbitrary ramp design ● Complete vacuum and support girder systems ● Commissioning of the booster to meet the customer's beam specifications

Providing a turnkey solution was critical to achieving the overall timescales that CLS required for the success of the project. This is becoming the standard procurement model at the third generation sources currently in plan. The purchase of significant equipment packages from industry brings the overall benefits of speed, cost and significant reductions in the level of "in-house" manpower required.

Quadrupoles and dipoles for the CLS booster



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The joint management team of Danfysik and Oxford Danfysik

Oxford Danfysik - a wider perspective on synchrotrons

Oxford Danfysik is a new UK based company in the Danfysik group. It has its roots in the Beamlines Business of Oxford Instruments and was purchased by Danfysik earlier this year. Oxford Danfysik focuses on supplying complete synchrotron light beamlines, subsystems and components. Its customer base is extensive and includes all the major synchrotrons worldwide with an installed base of more than eighteen complete beamlines.

The new product portfolio extends Danfysik's existing range of synchrotron offerings, which comprise complete booster synchrotrons, magnets, power supplies, insertion devices and other accelerator components. Our products now cover the complete range from the electron source through to the final delivery of photons to the experiment. It is a deliberate feature of our existing and future product ranges that we offer both standard and customised designs - providing value through both low cost and specialised performance.

The team of beam line physicists, engineers and technicians in Oxford is lead by Nigel Boulding, Managing Director and the sales team by Dean Morris, both experienced in synchrotron and beamline technology. I am confident that our customers will find that the joint teams in Jyllinge and Oxford can offer an outstanding expertise, service, and products covering the most comprehensive range of technologies required for synchrotron light sources.

I look forward to continuing the good relations with all our synchrotron customers - in a wider perspective.

Bjarne Roger Nielsen

Managing Director

High performance wiggler installed at SLS combining

- ***Small gap***
- ***High field***
- ***Short period***

Designed for maximum horizontal flux density in the range 5-40 keV with a total power not exceeding 8 kW. Pushing the limits for high field multipole wiggler designs, the latest Danfysik insertion device installed at the Swiss Light Source in Villigen features:

- High field of 1.9 Tesla
- Small gap of 7.5 mm
- Short period of 61 mm
- 65 poles
- 2 m length

As recognised by Gerhard Ingold of SLS ... "this presented a special challenge". Part of that special challenge was to handle the problems due to the small gap where small magnetic imperfections in the permanent magnets were found to play a significant role. Danfysik's Franz Bødker presented a poster on his work to solve this problem at the SRI meeting in Wisconsin this August.

Delivered to SLS, installed and accepted this summer, the high performance insertion device is used for the Materials Science beamline. This beamline produces a high flux of hard (5-40 keV) x-rays and sequentially serves three experimental stations: computer microtomography, powder diffraction and in-situ surface diffraction.

Danfysik is also working on commercial versions of the ESRF in-vacuum undulator, having licensed designs from the European synchrotron. Such insertion devices together with the high performance narrow gap wigglers are expected to play a large part in the new third generation sources coming on-stream within the next 5 years.

Probably the highest performing multipole wiggler in the World.





**CAMD,
APS, ANKA,
BESSY...
...a busy year
for Oxford
Danfysik
installation
technicians!**

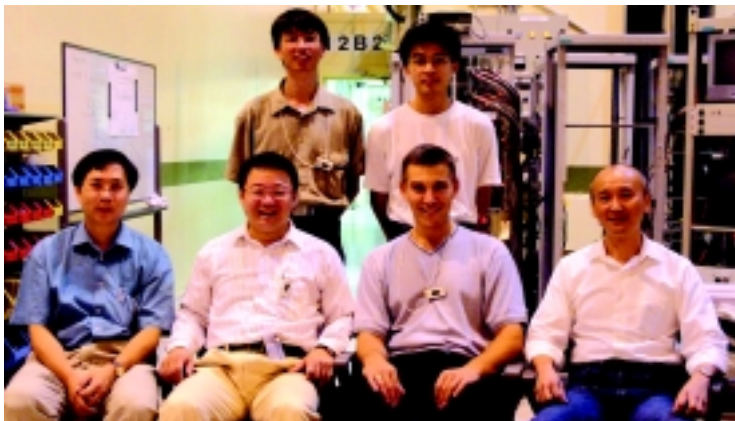
Installing a one metre long mirror system at SPring8.

Oxford Danfysik is the World's leading supplier of complete beamlines, sub-systems and components to the x-ray synchrotron market. Our core competencies are focused on delivering value across the whole of the project and we employ the right staff to do that:

- Project management** ▶ **engineering group**
- Optical design** ▶ **synchrotron specialists**
- Detailed optical design** ▶ **optical specialists**
- Advanced mechanical design** ▶ **design group**
- Manufacture** ▶ **manufacturing group**
- Assembly** ▶ **manufacturing group**
- Test** ▶ **manufacturing and engineering groups**
- Installation** ▶ **manufacturing group**

The staff who deliver this last key stage of a project need a high degree of training, expertise and initiative. The Oxford Danfysik team of installation technicians has those qualities and has received high praise (and some job offers!) at all the customer sites Worldwide. For example, following the installation at BESSY of two beamline systems, Professor Alexei Erko commented "your technicians do an excellent job and it is a pleasure to work with them". A number of mirror systems were recently installed at NSLS, Brookhaven, "the Oxford Danfysik staff were very professional....", said Dr Dieter Schneider, "...and also very friendly".

"Getting the job done and giving confidence to our customers".



Part of the team! Simon at the Taiwan beamline at SPring8.

New bipolar power supply -model 896

- **High performance**
- **Outstanding stability**
- **High affordability**

Ideal for low field beam correction applications and specified by Oak Ridge National Laboratory for their SNS programme.

Utilising the latest DCCT (Direct Current, Current Transducer) designs and building on the very high reputation earned with existing Danfysik customers, this new range goes more than two ways to deliver improved value. The headline specification shows:

- Power range up to 1.5 kW
- Current range up to 20 A - designed for parallel operation for higher currents, with single ended bipolar output amplifier
- 100 ppm current stability
- Short circuit and open circuit operation
- Reduced output noise through linear amplification
- High efficiency, typically 80%
- Air cooled with low acoustic noise



Other user benefits include the ability to operate either with or without interface signals (the internal reference is active in local mode) and usable 4 quadrant operation.

Technical notes: The output stage is a linear amplifier supplied from an H-bridge push-pull power converter. Keeping the voltage across the linear amplifier to a minimum voltage optimises the efficiency of the converter. A maximum output voltage clamp is introduced into the convertor, to protect open circuit conditions.

Exceeding expectations - New ULTRASTAB® products to R&D and the industry

New ULTRASTAB® transducer with on-board electronics

- *High performance* has been the key element in all DANFYSIK products, and has certainly been the basis when designing the new ULTRASTAB 867 precision current transducer. A product aimed for both the R&D and the Industrial market, giving customers a product capable of measuring currents from 0-400 Amps, at a metrology level.
- *Smaller size* is critical in many applications in both R&D and Industry. "A lot of design work and engineering has been put into the development of the 867, enabling us to introduce a new high precision transducer with physical dimensions of only 77x93x43mm!" says leader of the department Per H. Christensen.
- *Lower price* is of course always an issue, which was achieved by carefully improving both production methods, material selection, and design.
- *Well proven technology* has been transferred to the ULTRASTAB 867 product from the reliable ULTRASTAB 866 current transducer product, which now has reached an installation base of more than 10,000 units!



Improved shielding on all heads

- *Improved shielding* allowing up to 100 Gauss external magnetic fields, and still maintaining the superior performance, has been realised on all ULTRASTAB transducer heads ranging from 2000 Amps and all the way up to 25,000 Amps, using an enhanced shielding design.

Current extender for power analysers

- *Two compact multi-channel systems* have been developed to cope with increasing demand from Industry.
- *Smart head technology* is used in a new 3-6 channel plug and play compact rack system, for currents from 0-600 Amps.
- *Redesigned 2000P programmable transducer head* with improved performance, is the heart of the new 3-6 channel ready to use rack system, measuring currents from 0-2000 Amps.

Counting around the World... ...less is more

Oxford Danfysik has launched a new addition to its range of ionization chambers. The new IC PLUS has the very short electrode length of 10 mm which gives a very compact intensity monitor. This has the following benefits:

- Absorbs a small fraction of the beam
- Ideal for very crowded end stations (eg protein crystallography)
- Minimises forward scatter



IC PLUS 10

Like the other IC PLUS chambers - 50 mm, 150 mm and 300 mm - a dedicated electronics module is available to provide:

- Preamplifier
- Voltage to frequency converter
- Input offset
- High voltage supply
- RS232 communications port and user inputs/outputs



IC SPEC

The IC PLUS range is now being used at most of the synchrotrons around the World. For EXAFS and other high resolution spectroscopy applications, the IC SPEC has optimized capability and performance.

Danfysik for all your beamline products

- *Beamline diagnostics*
- *Beamlines for synchrotrons & particle accelerators*
- *Complete booster synchrotrons*
- *Double crystal monochromators*
- *Electrostatic systems*
- *Grating monochromators*
- *High stability power supplies*
- *Ionisation chambers*
- *Isotope separators*
- *Magnets - dipoles, quadrupoles & multipoles*
- *Mirror systems*
- *Multilayer monochromators*
- *Precision current transducers*
- *Scintillation counters*
- *Slits*
- *Synchrotron insertion devices*