Fiber Optics Makes a Difference

**High temperatures**
The mining and steel producing corporation LKAB is one of many companies that works hard to lower energy consumption and reduce the environmental impact of their activity. In a joint effort RISE Acreo and partners in the steel industry have developed fiber-optic technology that:

- Improve monitoring and control of steel production processes
- Enable real-time temperature measurements in, for example, blast-furnaces, ladles and molds
- Monitor the gaseous chemistry in the steel chamber

RISE Acreo has performed experiments in steel refinement processes at for example SSAB and LKAB. Further work has been planned with several other steelworks in Sweden.

**High precision**
Fiber optics enables more efficient and precise machining techniques with benefit to the manufacturing industry. There is an increasing need for cost-effective high-precision manufacturing. One reason is the growing demand for inexpensive, high-quality optical components for portable consumer electronics, such as mobile phones and digital cameras.

RISE Acreo has an ongoing collaboration with System 3R, a supplier of high-precision tools for the manufacturing industry. Together we have developed a fiber optic measurement system for high-accuracy positioning. The sensor measures the absolute distance between a fiber tip and an object within tens of nanometers. The fiber tip can be integrated with other equipment to enable more accurate workholding or machine calibration. This has potential to improve the accuracy of automated production.
**Extreme environments**

Acreo Fiberlab is one of the world’s most advanced facilities for the development and production of specialty optical fibers. Examples of specialty optical fibers applications:

- Advanced gyroscopes
- Sensors for electrical potential/current
- Fiber lasers
- Industrial communication solutions

Many applications require fibers that are specifically tailored for the application environment. This is the case for oil and natural gas exploitation, where the equipment is exposed to hydrogen, steam, temperatures above 300 °C and generally harsh conditions. Acreo has developed unique process techniques for fabricating fibers suited for such demanding environments.

**Nanoseconds**

RISE Acreo has developed a unique technique for fiber optic pulse control. Components based on this technology are currently being developed for commercial application in fiber lasers and laser systems. The ability to control the pulses in the fiber core rather than outside of the fiber has several benefits for optical high-speed systems. Some examples are:

- Improved stability
- Improved manufacturability
- Reduced optical losses

**Surgery of the future**

A tiny optical fiber can integrate a multitude of functionalities in medicine and biotechnology. An instrument probe, thin as a hair, can be used for making accurate incisions in tissue with laser pulses. The same probe can simultaneously deliver drugs or reagents through channels in the fiber, and perform a range of optical measurements. Another benefit is the biocompatibility of the fiber. It can remain in the body for months for repeated measurements and treatments, reducing the need for subsequent surgery.

**Acreo Fiber Optic Center**

The Excellence Center conducts technical development and applied research for new industrial products and fiber optic solutions. Today, a number of companies and several academic research groups are actively working together on new fiber optic technologies for future industrial solutions. Contact us if you are interested to join this innovative Center!