

## X-ray based systems for high speed flow visualisation and quantification

High stability, High imaging contrast, High Resolution X-ray Technology with tomographical imaging option.

### **Objectives:**

Real-time Flow Visualisation in large pipe spool test rigs for Three Phase Flow Quantification. The application is for oil and gas exploration where risk of plugs may arise. Computer models supported by real and large scale tests are needed in order to validate the conditions where catastrophic incidents may occur.

The X-ray technology suitable for oil & petrol reservoir modelling as well as for exploration research must provide a high imaging speed, a very high contrast to discriminate the constituents, and a high resolution. Climate control of the entire system is needed in order to cope with high (120 deg C) oven temperatures in the lab, and with rough weather conditions in outdoor spool rig applications.

### **Solution:**

The **InnospeXion X-RAY systems for Petroleum Exploration Research** are intended for the quantitative assessment of the 2- or 3-D studies of the flow of mixtures of oil, gas, water, debris, and other components in large pipe systems, in order to optimize the oil exploration possibilities through control of flow regimes, and studies of pipe plug formation methods.

The high contrast, high resolution imaging made possible integrating new detection technology is, when combined with a very high scanning speed, a very useful tool for quantitative and qualitative flow evaluation.

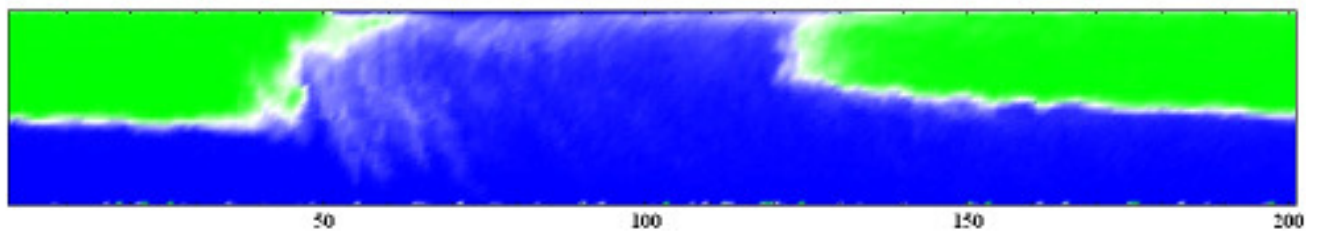
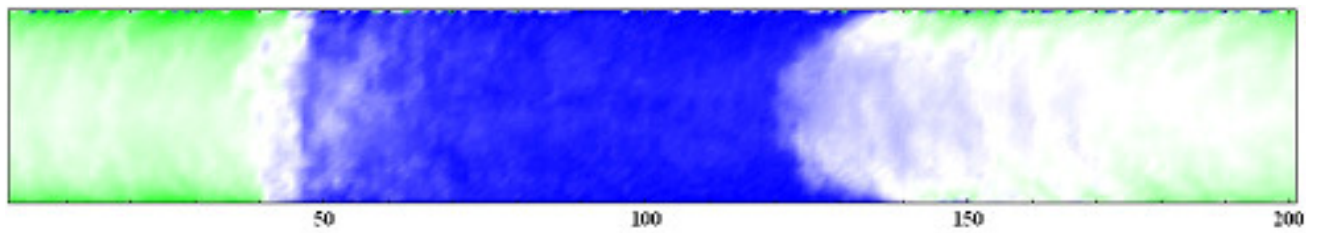
Our systems are delivered tailored to the application and based on the fastest and highest contrast and resolution detectors available on the market. We can integrate novel multiple energy pixel based detectors, also for high speed flow assessment. This enables constituent discrimination at pixel level, even at high flow speed.

The systems are provided with local and/or remote control, and with data acquisition and processing software in agreement with customers specifications. Initial FAT is accomplished at InnospeXion premises, followed by SAT following the on-site installation. APEX and other conformity requirements may be implemented according to request. Systems are supplied for usage in the laboratory, or for outdoor usage. In the latter case, systems are weatherproof and are supplied with heating and/or cooling system to accommodate for harsh conditions.

Figures:



1. Dual view X-ray system with integrated climate control for placement on spool rig pipe in northern Norway. Pipe internal diameter 200 mm. Imaging up to 10 m/s.



2. Example on flow images obtained on spool pipe with turbulent flow development between oil and water phases with debris, at 10 m/s.