

Temco, Inc.

Design Excellence in Core Analysis Instrumentation

Linear X-Ray Scanning System LXS-835



Temco offers a linear X-ray core scanning system that has been under continuing development and use for the last 20 years. The original technology was developed within a major research laboratory. The offered instrument utilizes the latest in available electronics and has been successfully in service for several years.

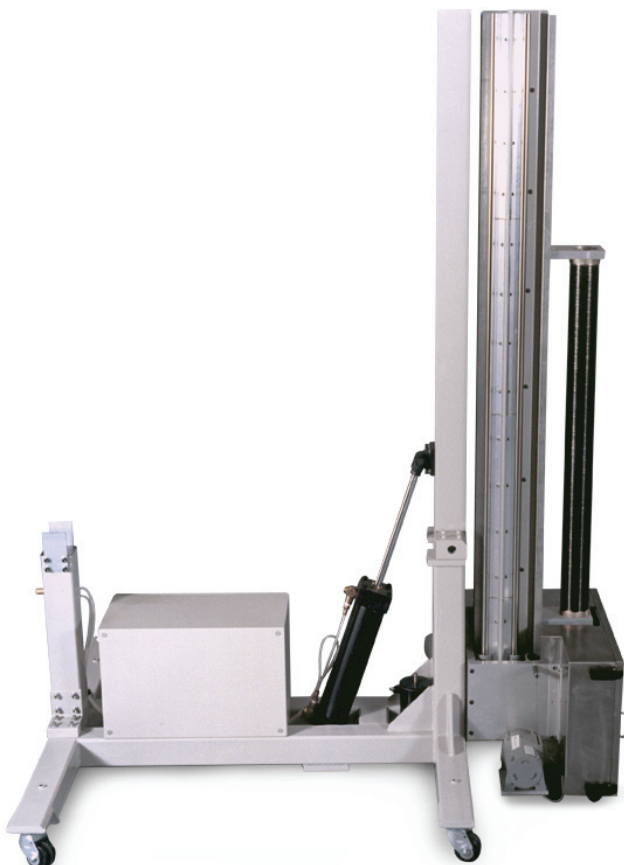
The linear X-ray core scanning system is used to measure the in-situ fluid saturation in a core plug sample during routine or special core flow experiments, such as steady state relative permeability. Data obtained from the relative permeability flow tests can be used in reservoir prediction calculations. The complete system comes with an X-ray table, source, detector, generator, core holder, core flooding system, and computer control and data acquisition system. Please refer to Temco's FCH series of core holders specifically designed for the X-ray scanning applications. Temco can provide the entire system, or various components to meet the customers requirements.

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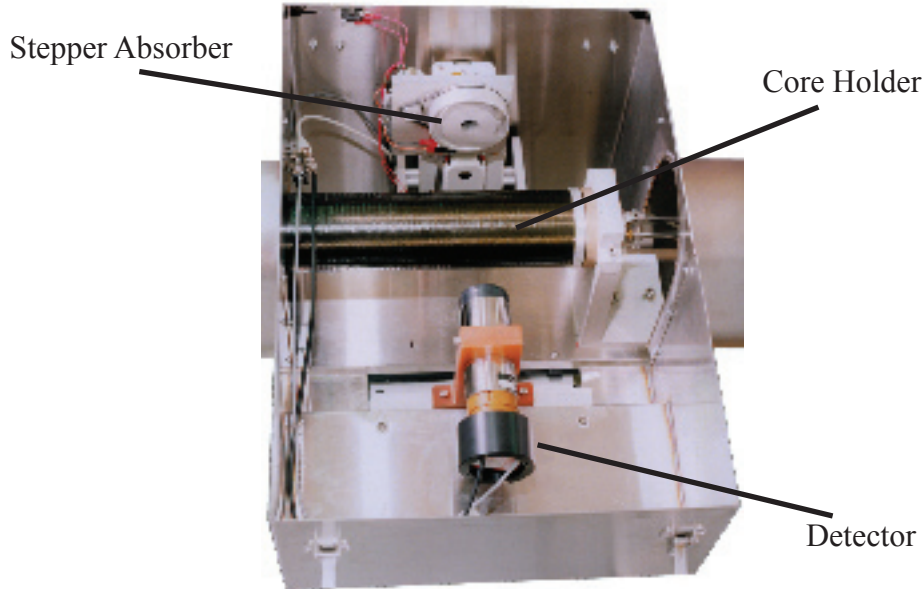
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Application

The instrument can be used to measure the fluid saturation within the core, typically the brine or water phase is doped with NaI. The NaI is a mono-valent ion which will absorb X-rays. Initially, the core sample is saturated with the doped brine phase and then the X-ray absorption is measured along the length of the sample. As the second phase, typically oil, is injected into the core holder, the X-ray absorption along the length of the core sample is measured. Applying Beer's Law and using the measured absorption levels along the core sample, the saturation profile along the core can be determined. Typical accuracy of the saturation level is within 1% of the saturation within that pore space scan. The X-ray source and detector traverse the length of the core sample with the aid of a stepper motor. A linear transducer and a built in encoder measure the position of the source and detector. The system then starts scanning at the identical position so that the user can compare core scans as a function of time. Below is a sample of the data displaying the saturation profile along the core length over time.

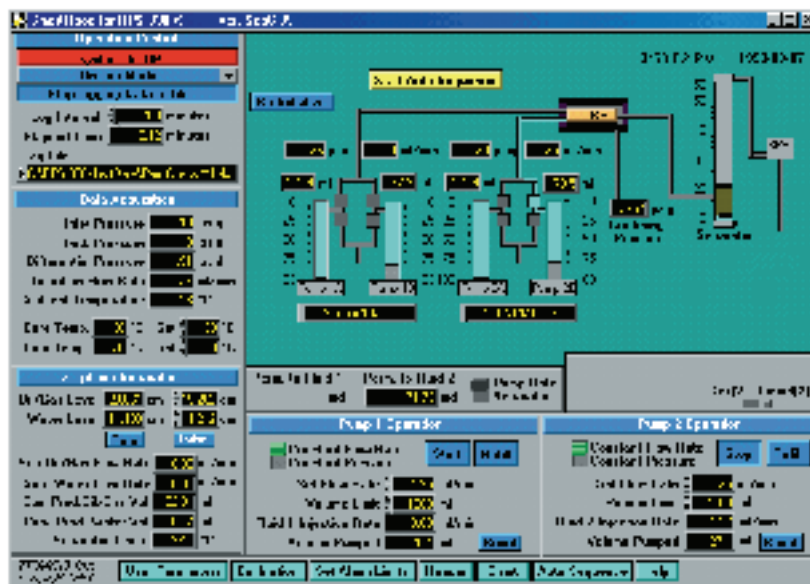


The intensity of the beam needs to be controlled in order to ensure that the detector is not saturated and that enough counts are received for proper statistical analysis. The intensity of the beam is controlled by rotating a stepped absorber between the source and core holder. See the picture that follows. The movement of the absorber is controlled with a stepper motor via a computer. The carbon fiber core holder is shown between the absorber and the detector. The core holder body is manufactured from x-ray scannable materials such as aluminum, carbon fiber, and epoxy. The X-ray source, absorber, core holder, and detector are contained within a stainless steel enclosure. The enclosure contains the X-rays and prevents leakage into the testing room. X-ray On/Off lights are mounted to the table for user safety.



SmartSeries™ Software

The SmartSeries™ control software is user friendly and allows the user to select the scan rate and core sample. Below is an example of the control screen for the core flooding system. For detailed information on the features of the SmartSeries™ software, please refer to the literature contained in the Temco catalog. The entire system is provided with in-house training of the Xray scanning techniques and the core flooding system and the complete system operation. Installation and training at the customer's location can be provided upon request.



Linear X-ray Core Scanning System Specifications:

X-ray Table - Model XT-2.34

Operations	Horizontal and/or vertical available
Scan length	69" (1.75 meter) standard
Motor	Stepper motor drive system
Position measurement	0.01" (0.25 mm) resolution standard
Shielding	Lead shielding
	Mounting plate for plumbing of flow test system
Scan Rate	1" (25.4mm) per minute maximum
Dimensions Horizontal	98" x 61" x 55" (2.5m x 1.55m x 1.4m) (WxDxH)
Dimensions Vertical	98" x 61" x 98" (2.5m x 1.55m x 2.5m) (WxDxH)

X-ray Source and Detector - Model XS-60

Source range	60 KV and 60 milliamps
Dimensions	24" x 33" x 28" (71 cm x 84 cm x 72 cm) (WxDxH)
Electrical	220 VAC 50/60 Hz 1 Phase 30 Amps

Core flooding system – Model RPS-830-X

System	Two Phase Relative Permeability Core Flooding System for X-ray Scanning
Includes	Control Panel, Metering Pumps (2 each), Measurement Electronics, Control Valves, Accumulators (2 each), Back Pressure Regulator, Temperature Controller, Confining Pressure Pump, and Vacuum Pump
Dimensions	54" x 40" x 72" (138 cm x 102 cm x 183 cm) (WxDxH)
Electrical	220 VAC 50/60 Hz 1 Phase 15 Amps

Computer software and hardware

Computer	Pentium- 2GHz minimum
Ram	512 megabyte minimum
Hard Drive	40 Gigabyte minimum
Drives	CDROM R/RW
Data acquisition and control hardware	
Monitor	17" SVGA
Printer	Inkjet Color
Software	Smart™ Series Software
Electrical	220 VAC 50/60 Hz 1 Phase 10 Amps

Core holder – Model FCH Series

Temco FCH series with aluminum, aluminum and carbon fiber, or carbon fiber body for X-ray scanning. Core specifications can be determined by the client.