DINSEARCH 5-00

Measurement of Cladding Thickness

The DINSEARCH 5-00 was developed for one specific application but has the potential to be used or developed to solve similar problems.

The picture shows the cross-section of an extruded pipe. The outer part of the wall is carbon steel, the inner part is Inconel. The pipe has been extruded from a steel billet which first had a hole bored through its centre and then the hole lined with Inconel using a continuous welding technique. The Inconel is metallurgically bonded to the billet and remains bonded after extrusion.

The DINSEARCH 5-00 was developed for use in the pipe mill to measure the thickness of the Inconel lining in the pipe after extrusion.

The DINSEARCH 5-00 can be used for any similar situation where it is necessary to measure the thickness of substantially non-magnetic lining in a strongly magnetic outer.

By changing the sensors it would be possible to use the DINSEARCH 5-00 for different combinations of materials and for non-magnetic outer layers.

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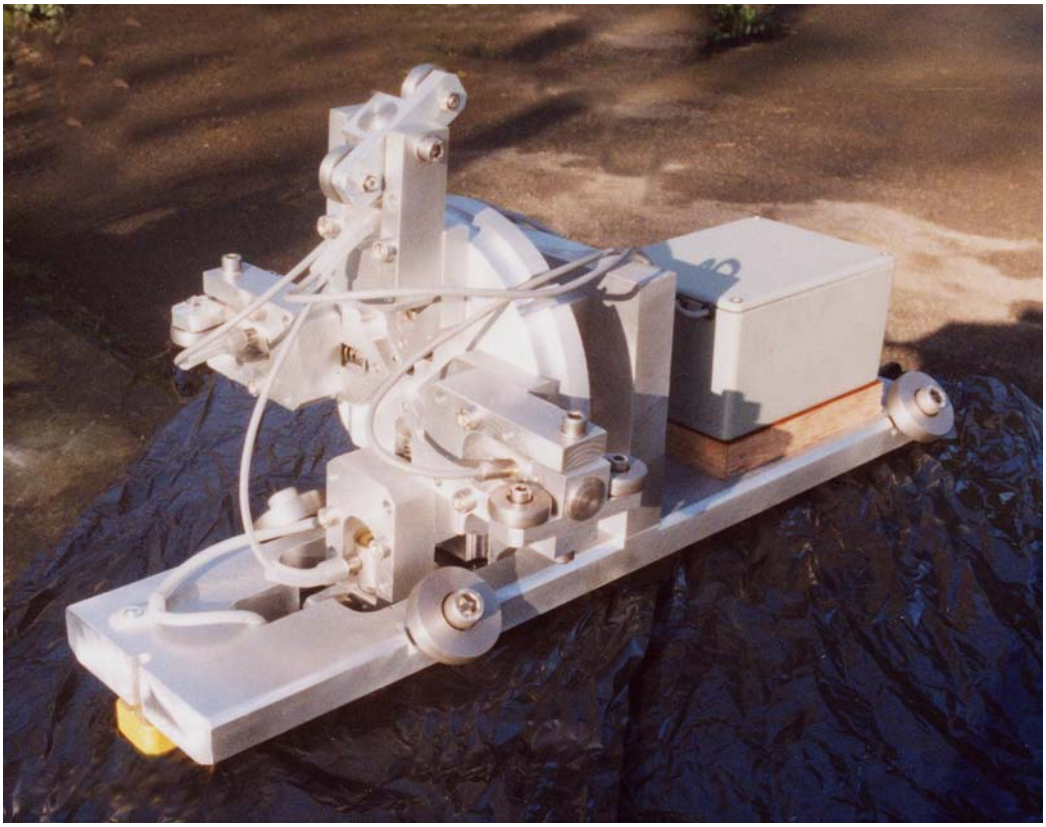
The Probe Head

A probe head is pushed and pulled through each length of pipe.



The picture shows a typical probe.

The head carries several sensors in order to detect radial variations in clad thickness, such as eccentricity. Normally 4 sensors are sufficient but up to 8 can be accommodated.

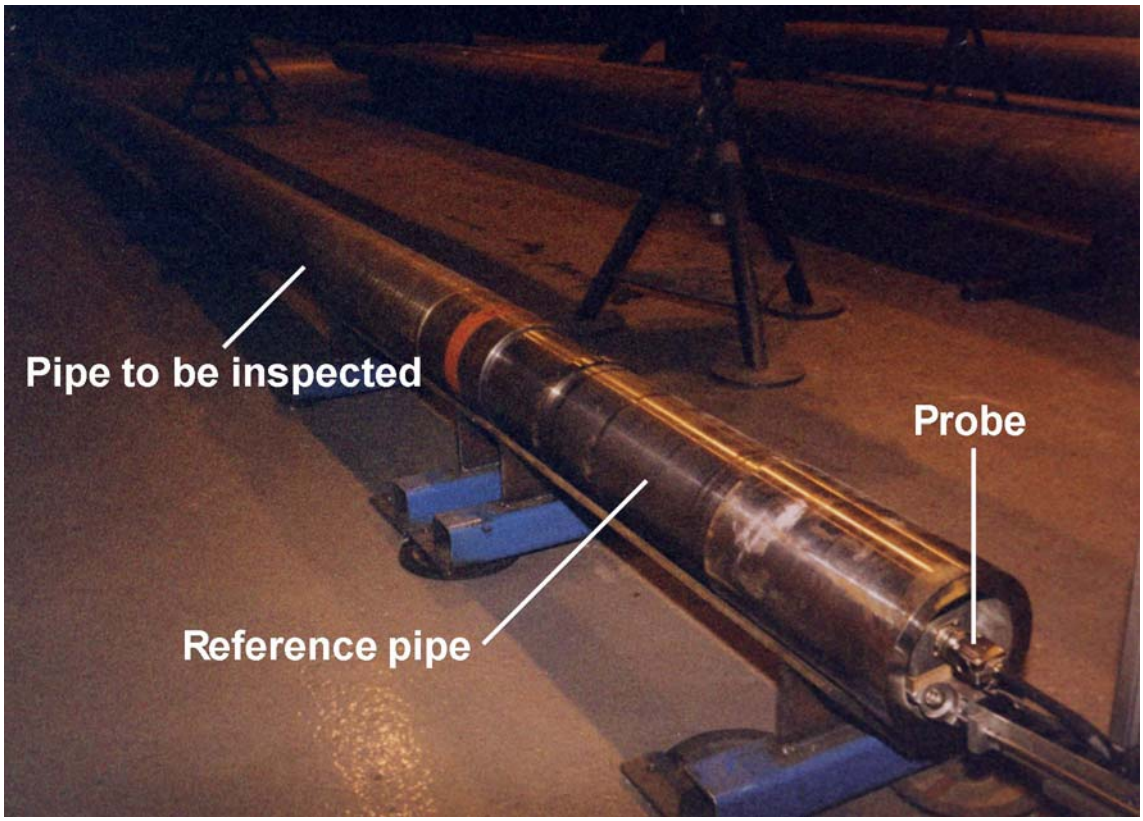
The sensors are continuous reading. A computer data collection system samples the readings at pre-determined intervals, typically 500 samples per second. The pull speed through the pipe is typically 0.5 metres per second resulting in clad thickness reading every millimetre. Faster pull speeds and sampling rates are possible.

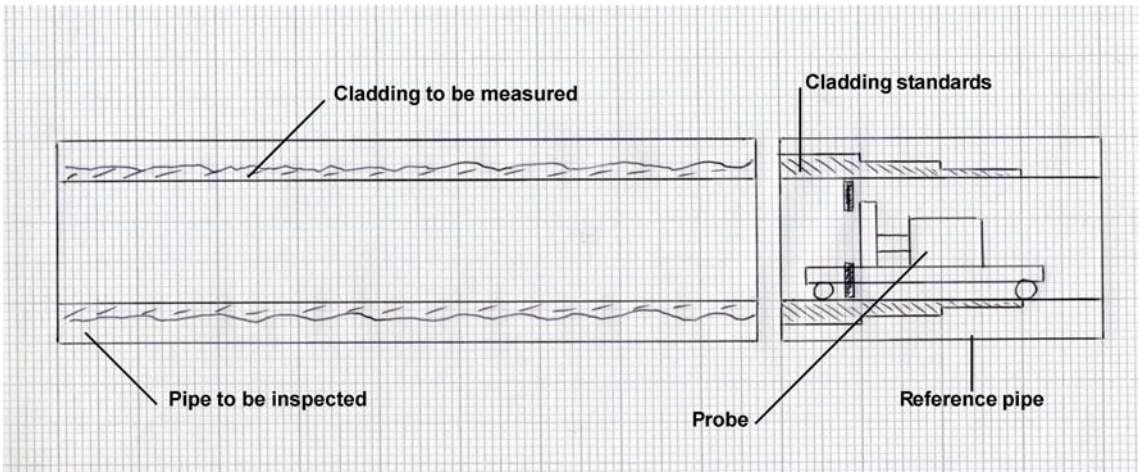
The probe uses electro-magnetic sensors to measure the thickness of the cladding. Such sensors can experience long term drift in their zero setting, consequently, they are best used to compare two lengths of pipe and show the differences rather than use the sensors for an absolute reading.

The Test Bed and The Reference Pipe

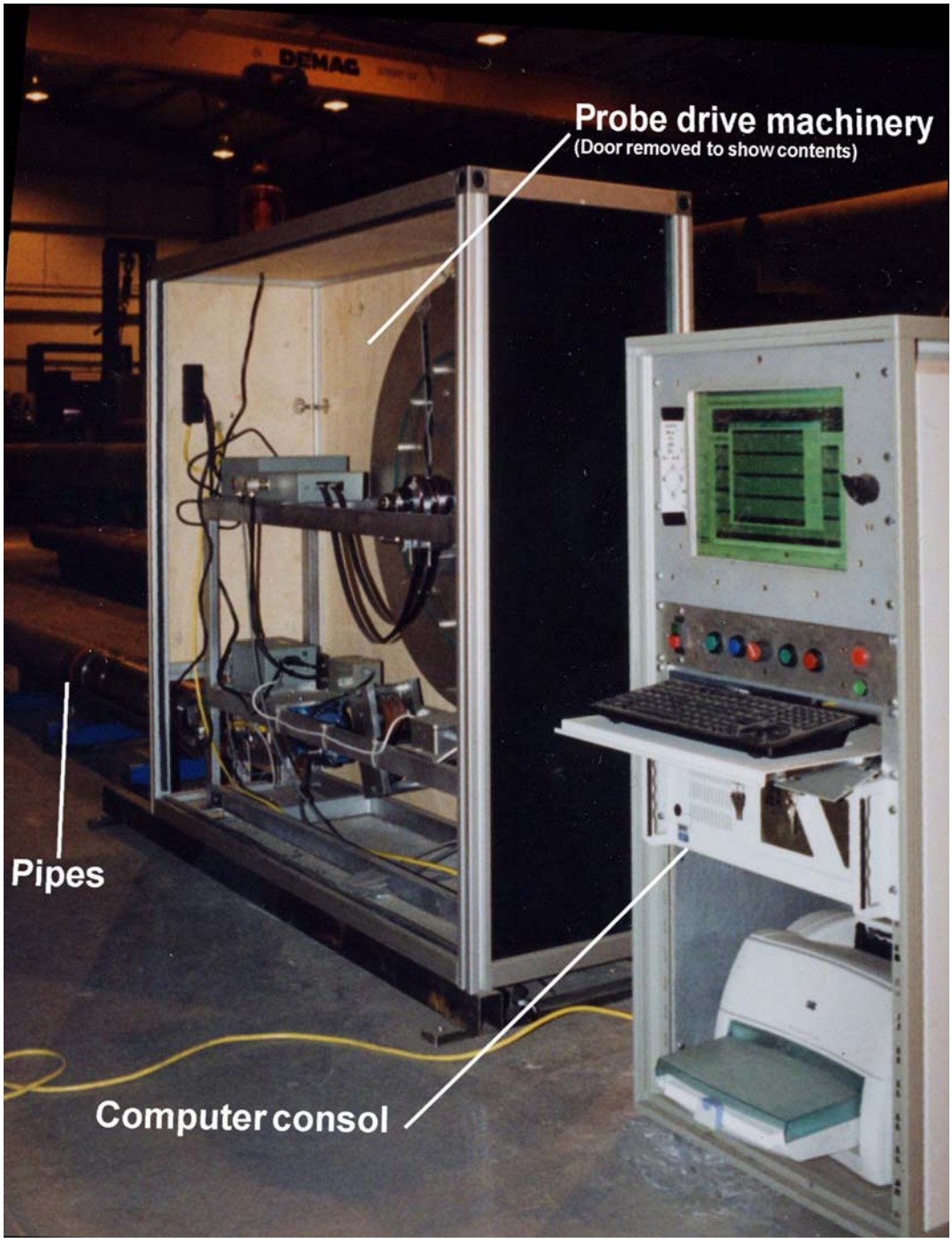
The pipe to be inspected is placed in line with a reference pipe, the probe normally ‘lives’ in the reference pipe and is driven out into the other pipe for the inspection run.

The photograph shows an actual pipe mill set-up, the drawing helps to explain the arrangement.





The Probe Drive



Machinery to push and pull the probe and a drum to coil up the cable are housed in a large cabinet.

The computer to collect and process the data, as well as the controls to operate the machine, are housed in the computer consol which is generally placed close to the main part of the machine.

Data, its Display and Processing

With the pipe in place, the operator runs the machine and, at the completion of the scan through the pipe, the data collected is displayed on the computer screen.

In this example, there were 4 sensors on the probe head, hence the 4 traces on the screen.

The main part of each trace shows the variation in cladding thickness along the length of the pipe on the track of that particular sensor. The steps at the right hand end of the traces are the steps in the reference pipe to confirm the calibration of the machine.

The traces can be magnified and stretched to show greater detail. The enhanced views appear in the big, lower block on the screen while the upper, smaller block continues to show the full trace as an index and location for the shorter, enhanced section.

The scale along the top of the blocks shows the distance from the far end of the pipe.

There are alarm levels that can be set to warn if any part of the cladding is out of specification, too thick or too thin.

Providing that the piece of pipe has a unique reference code, the data can be saved for future reference as a quality confirmation for that pipe.

Summary lists of pipes inspected and the spread in cladding thickness are produced automatically.

General Specification

This specification gives a general indication of the capabilities of the equipment. Dinsley Devices Ltd. would be pleased to discuss possible variations other applications.

Cladding thickness measuring range:-	0 to 10mm
Resolution:-	0.1mm
Reproducibility, affected by the condition of the bore of the pipe, particularly if there is loose debris:-	±0.1mm
Pipe bore:-	125mm to 300mm
Pipe length:-	up to 14 metres
Inspection speed:-	0.5 metres per second

Inspection rate depends on the length of the pipe and on the time taken to load on the machine. With 12 metre pipes, the rate is typically 10 per hour.

Power supply requirements:-		A.C. mains supply, 50/60Hz, 500VA, 110V and 240V are standard, other voltages by arrangement.
Overall size:-	Main cabinet:-	2.5m x 0.7m x 1.5m high
	Computer cabinet:-	0.7 x 0.7 x 1.2m high
	Pipe stands:-	To suit the length of pipes

Overall weight, main cabinet and computer:- 250kg

For additional Information or to discuss possible applications:-

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