



WIRE MESH SENSOR (WMS)

Wire Mesh Sensor (WMS) is a state-of-the-art intrusive instrumentation measuring the instantaneous distributions of the phases in two-phase flows. WMS consists of two planes of wire electrodes; transmitter and receiver planes. The wires at each plane of WMS are stretched parallel to each other and separated by a few millimeters. The wires of the two planes virtually cross each other with an angle of typical 90° and a small axial distance, typically smaller than the lateral resolution. These virtual wire crossings are defined as the crossing points. The number of the crossing points in a WMS device vary from 8x8 wires (Da Silva *et al.*, 2011; Prasser *et al.*, 1998) to 64x64 wires (Pietruske and Prasser, 2007; Prasser *et al.*, 2007; Roitberg *et al.*, 2008). The measurement of the phase distributions are conducted at these crossing points by measuring the electrical conductivity for conducting fluids or permittivity for non-conducting fluids. From these conductivity or permittivity measurements, the amount of liquid and gas in the single volume elements, defined by the crossing points, is calculated by applying specific calibration models depending on the system, the fluids, and their physical occurrence e.g. stratified or emulsion. The easiest of these models is the assumption of a linear relation between the measured values and the gas/liquid holdup in the sample volume. Successful demonstrations of such measurements at high frequencies (in the order of 10⁴ Hz) are originally reported by Prasser *et al.* (1998) for water/air applications, and by Da Silva *et al.* (2007) for silicone oil/air applications.

At TUFFP, there are several types of WMS instrumentation that can be used in pipelines with an ID from 2-in. to 6-in. for both conducting and non-conducting fluids. The table below gives the specifications of all the WMS devices excluding their associated electronics / Data Acquisition systems. Also, some photographs of the system components are given from Figure 1 to 3.

Pipeline ID	Number of Wires	Quantity
2-in.	16x16	1
3-in.	24x24	4
6-in.	32x32	2
6-in.	48x48	1



Horizontal Well and Artificial Lift Projects



Figure 1. Dual WMS installed at 6-in. High Pressure Large-Diameter Pipeline Flow Loop.

TU Horizontal Well and Artificial Lift Projects
University of Tulsa
2450 East Marshall,
Tulsa, Oklahoma 74110

<http://tuhwalp.ens.utulsa.edu/>
Phone: (918) 631-5110
E-Mail: kelley@utulsa.edu



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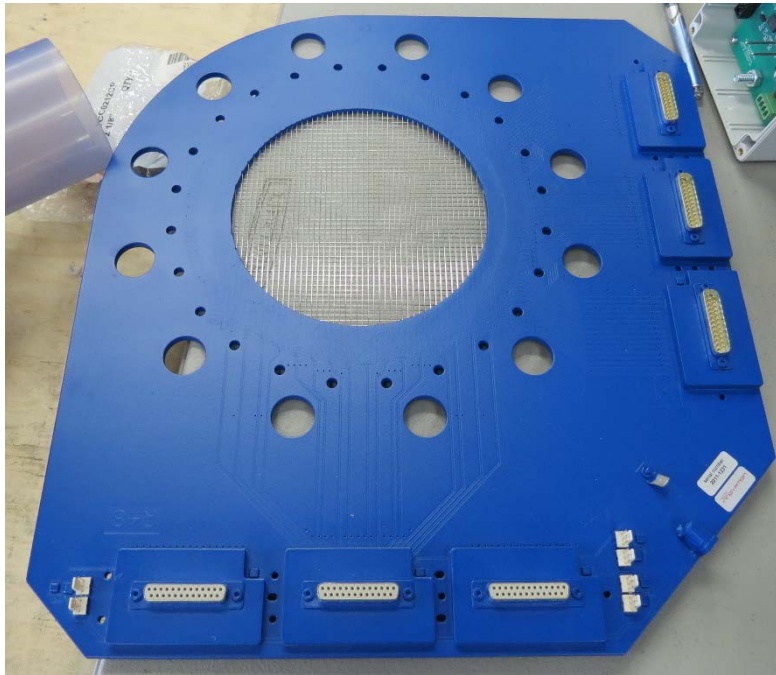


Figure 2. WMS measurement board (48x48 wires with an ID = 6-in.)

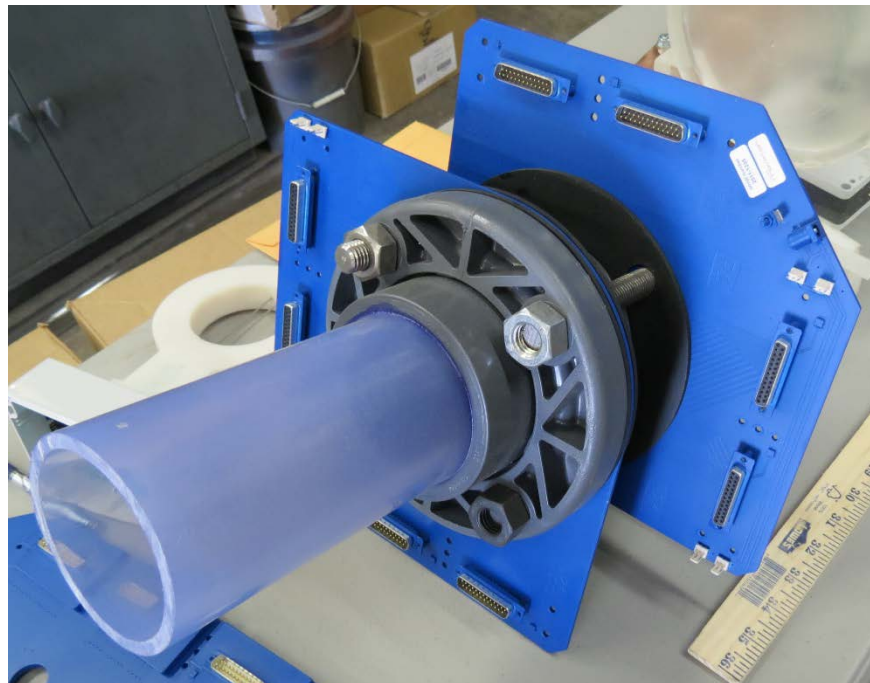


Figure 3. Dual WMS installation for a 3-in. ID pipe.

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Phone: (918) 631-5110
E-Mail: kelley@utulsa.edu



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