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INVESTIGATION INTO THE POSSIBLE APPLICATION OF THE INFRAMAX SUSPENDED SOLIDS METER FOR MEASURING SUSPENDED SEDIMENT IN THE FIELD

by

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Investigation into the possible application of the INFRAMAX SUSPENDED SOLIDS METER for measuring suspended sediment in the field

OBJECTIVE

A calibration test was carried out upon an Inframax suspended solids meter together with a pre-calibrated Partech siltmeter. The purpose of carrying out such a test was to investigate the possible application of the instrument for measuring suspended sediment concentration in the field. This involved looking closely at any practical difficulties in operation and at the range and sensitivity of the instrument. It was also necessary to look at the overall performance of the instrument in comparison with that of the Partech siltmeter currently used for field measurements.

Both instruments operate on a photoelectric principle of single gap light absorption . This system consists of a single light source with one light beam focussed across a gap, operating a photoelectric cell. The photoelectric cell operates an electronic circuit to give a reading on the dial and a voltage or current output.

METHOD

The calibration test involved placing both instrument sensors in a tank containing a fixed volume of clear water and then increasing the concentration of suspended solids in steps by adding pre-weighed amounts of dried mud. After each addition, readings were taken from both instruments. This was repeated for solids content up to 20 g/l and 10 g/l.

Before the calibration could commence, however, the zero and maximum values for the Inframax had to be set. The sensor head was placed in clear water and the maximum control potentiometer turned fully on. Then the zero reading had to be adjusted by means of the minimum control potentiometer. This was very difficult as a very small turn of the potentiometer caused a full scale deflection. There was also a long delay before the reading dropped or increased to a constant value. Once the zero had been set the sensor had to be placed in a sample corresponding to the upper limit of solids concentration. As the directions manual quoted 20 g/l as the upper limit of the span this was taken as the maximum value. Thus an accurately measured 20 g of dried mud was added to an exact litre of water and agitated continuously whilst the sensor was immersed. The maximum control potentiometer was then adjusted to give a deflection on the scale of 100%. After removal from the sample the sensor was washed and returned to the calibration tank. The calibration was carried out as described above.

Three problems arose with the reading of the instrument during the calibration.

1. After switching on the instrument will stay on for about 45 seconds and then switch off automatically.
2. The scale was only marked in divisions of 5% and hence was difficult to read even to 1%.
3. Nowhere in the manual did it say whether the % value given was % non-transmission of light or % suspended solids content. Hence it was not known if the relationship should be linear or otherwise.

RESULTS

The readings at various solids concentrations are shown in Table 1 and calibration graphs are shown in Figs 1 and 2.

It was seen from the results of the first calibration that the saturation point seemed to be just over 10 g/1. (See Table 1a and Fig 1) Hence the instrument was re-set so that 10 g/1 was equivalent to 100% deflection and the calibration was repeated for the reduced range of values. The second set of results (Table 1b and Fig 2) show a marked improvement. However, 10 g/1 is still close to the saturation point as can be seen.

COMMENTS

From the manual it seems that a linear law is assumed to relate suspended solids concentration to percentage non-transmittance of light. This is known not to be true for larger ranges of suspended sediment concentration; but as the range only extends as far as 10 g/1 the law could just be assumed to be linear.

The range is too small to be of real use in the field as suspended solids concentrations in excess of 20 g/1 are common.

The practical problems of setting up the instrument and its operating difficulties are generally worse than the Partech siltmeters.

The output for 100% deflection was quoted as 20 mA which is difficult to read to a high accuracy.

CONCLUSION

The instrument is not recommended for use in the field due to its small range and its many operating problems.

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Table 1a

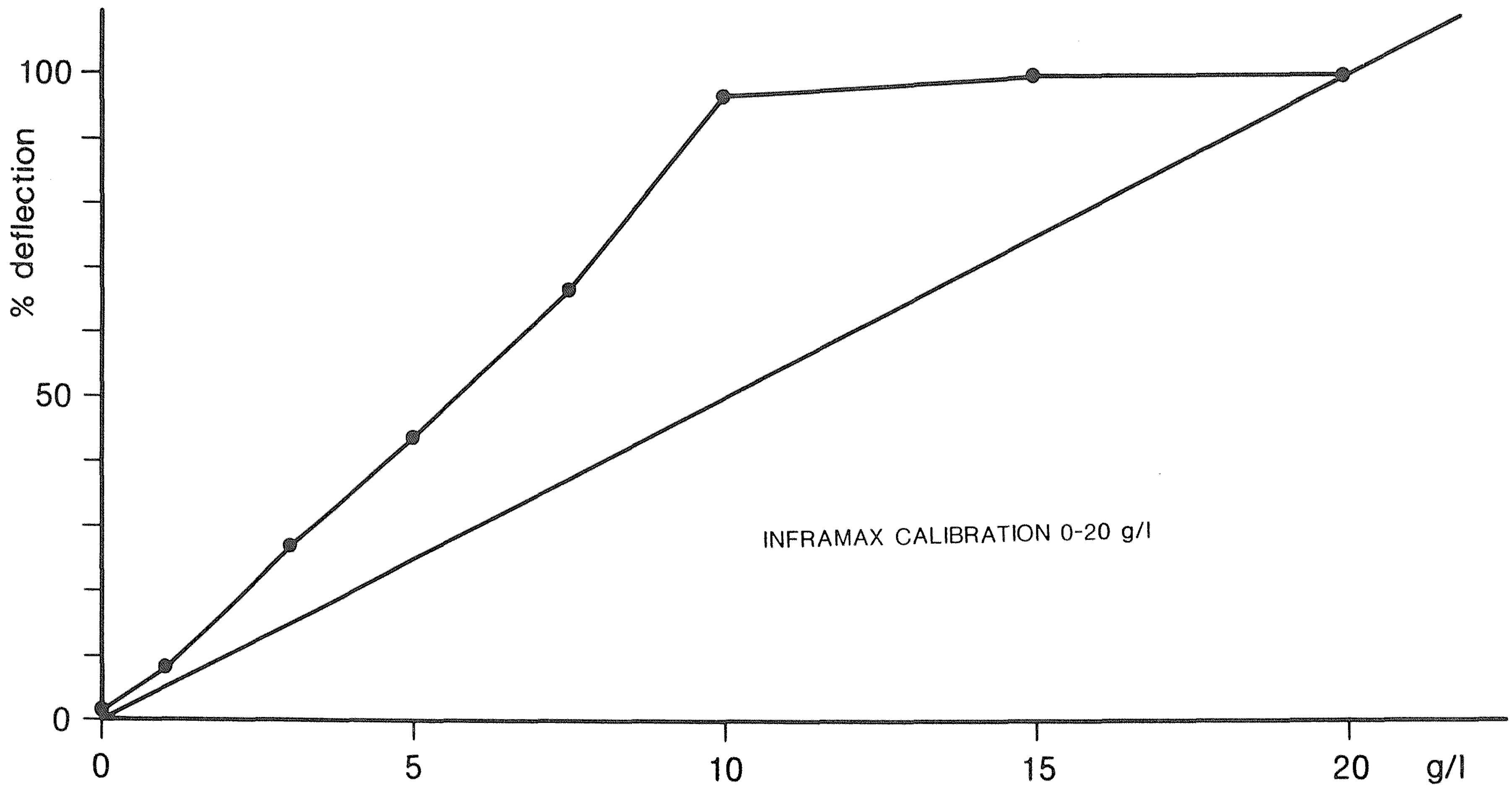
Calibration results when 20 g/1 = 100% deflection

g/1	% Deflection	PARTECH Siltmeter 'D'	
		F.S.D. 0.5 (mV)	F.S.D. 1 (mV)
0	1	-30	-27
1	8	75	149
3	27	412	450
5	44	610	1250
7.5	67	735	1500
10	97	809	1650
15	off scale	882	1800
20	off scale	916	1860
0	1	-29	-25

Table 1b

Calibration results when 10 g/1 = 100% deflection

g/1	% Deflection	PARTECH siltmeter 'D'	
		F.S.D. 0.5 (mV)	F.S.D. 1 (mV)
0	1	-29	-27
1	11	188	294
2	22	282	580
3	31	428	890
4	40	538	1100
5	50	617	1270
6	61	681	1390
8	84	763	1560
10	off scale	817	1665
0	1	-28	-25
(Setting Sample) 10	off scale	819	1670



100
% deflection
50
0
0
5
10
15
20
g/l
INFRAMAX CALIBRATION 0-20 g/l

Fig 1a.

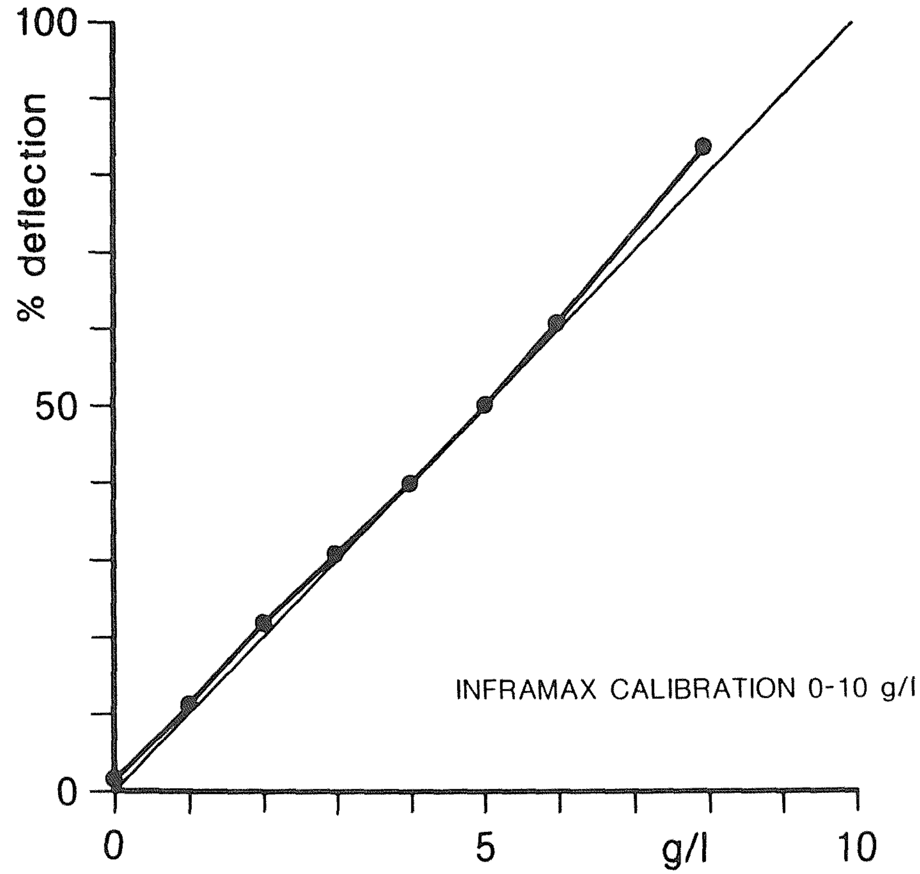


Fig 1b.

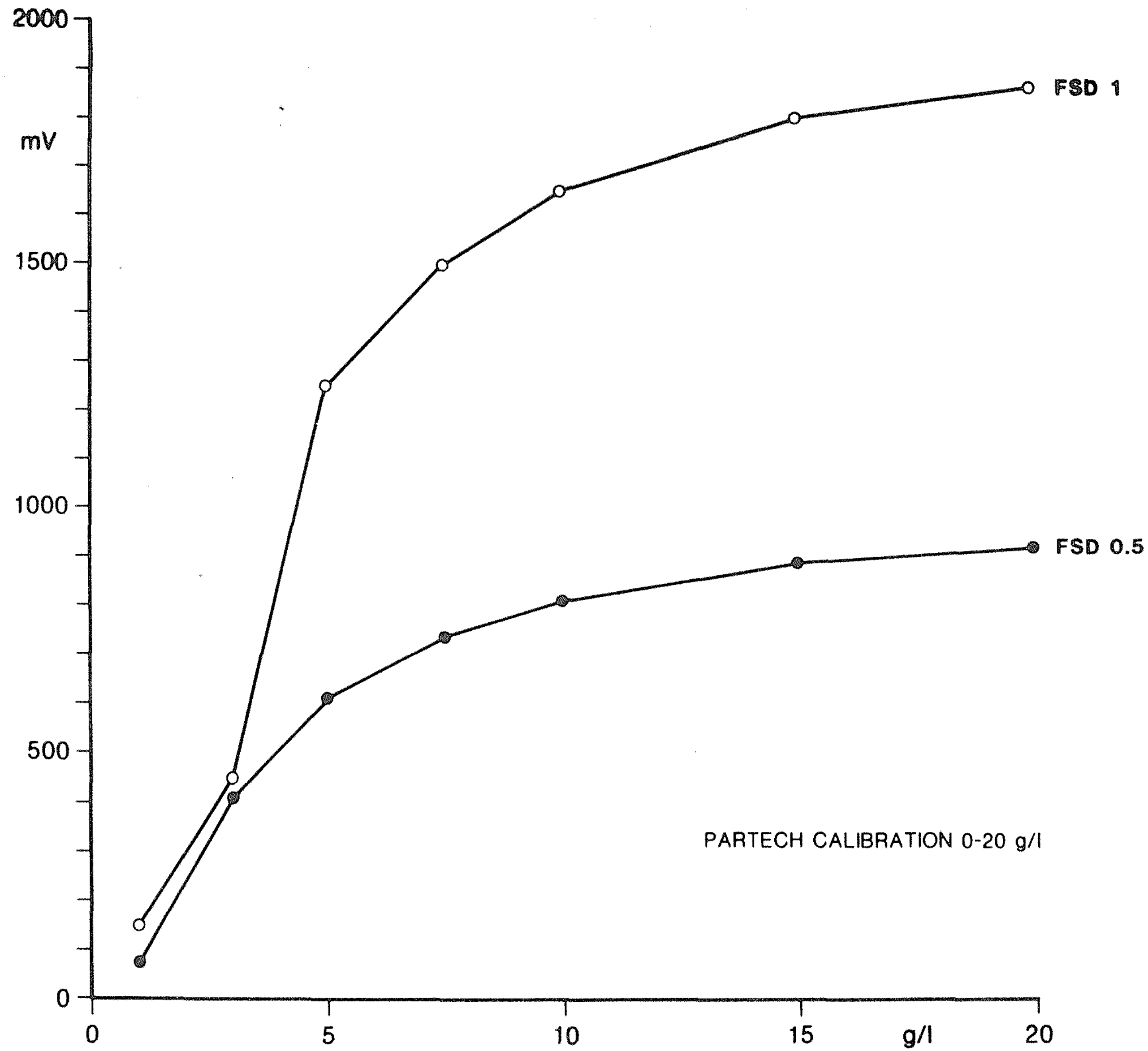

2000
mV
1500
1000
500
0
0
5
10
15
g/l
20
FSD 1
FSD 0.5
PARTECH CALIBRATION 0-20 g/l

Fig 2a.

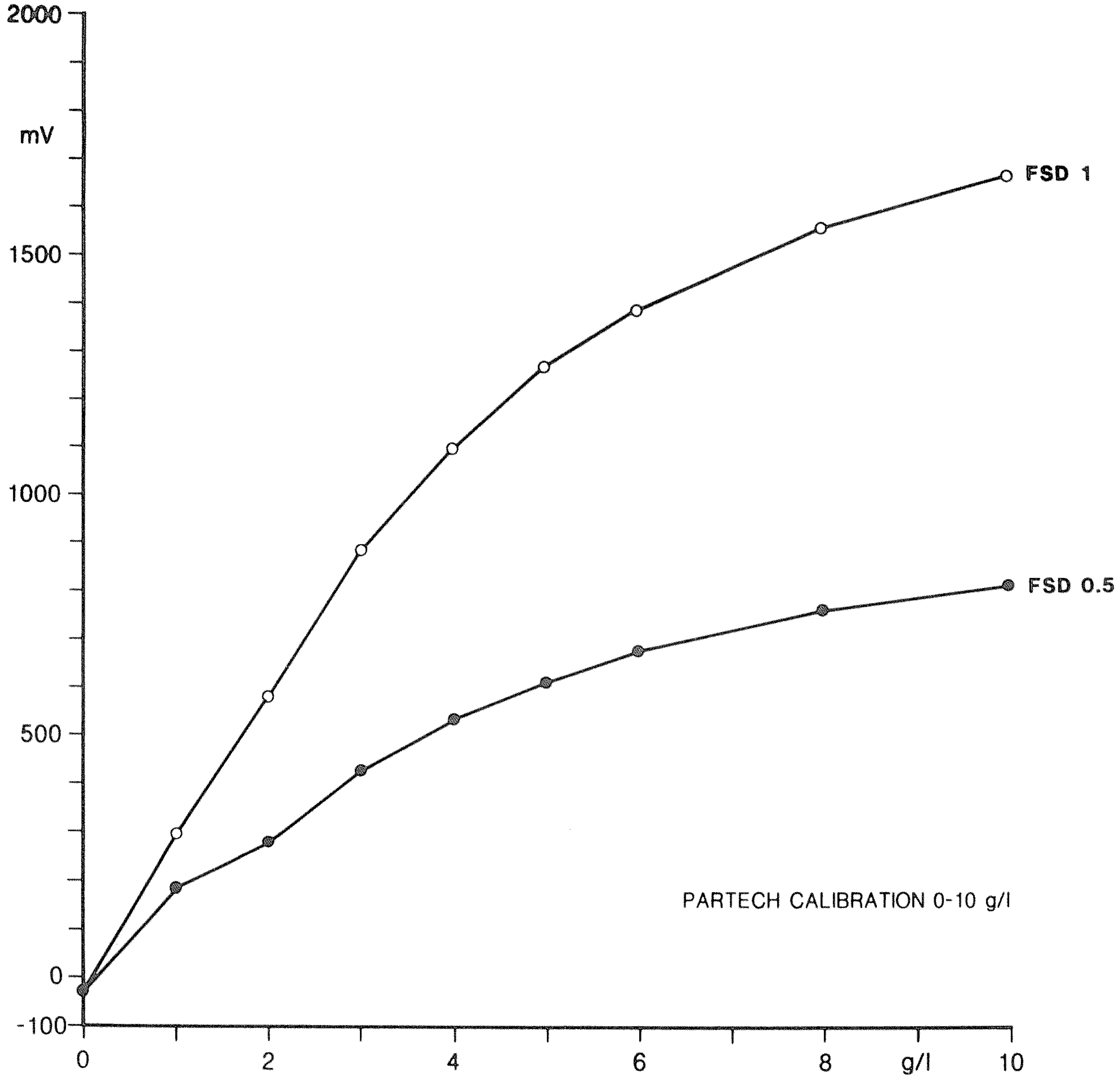

2000
mV
1500
1000
500
0
-100
FSD 1
FSD 0.5
PARTECH CALIBRATION 0-10 g/l
0
2
4
6
8
g/l
10

Fig 2b.