The MCA Moisture Sensors

FIBRO System AB, Sweden
Bernt Boström

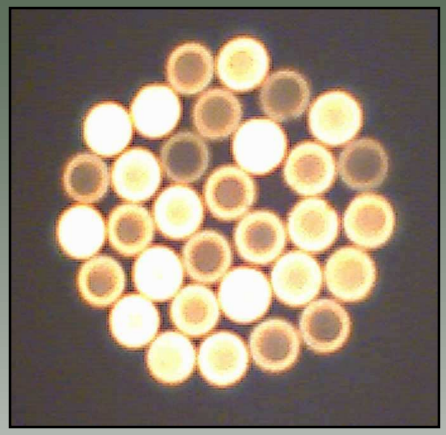
FIBRO MCA 1410/1420 Moisture Sensors

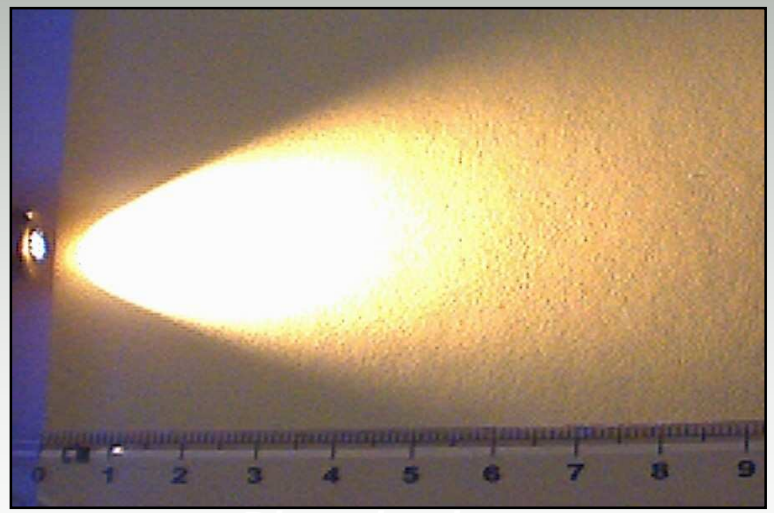
- Non-contacting measurements
- Reflected near Infra-Red light
- Real-time data
- Fibre Optics
- Narrow spaces
- Accessories offer great flexibility

Fibre Optic Cables

- 32 fibre bundles (16 out /16 in)
- Standard lengths are 1, 2 and 4 metres
- Max length is 10 m (46 bundles)
- Diverging Beam
- Operating distance 15-60 mm
- Spot size Ø10-40 mm

32 fibre bundles





Diverging beam

Triple-Beam System

- Detection at 1.940 nm
- Side bands at 1.800 and 2.100 nm
- Penetration depth is 200-300µm depending on optical density
- Backing considerations absorbent/reflecting

Application Considerations

- Range 0-60% MC (MCA1410)
- Range 15-90%MC (MCA1420)
- Temperature restrictions (<150°C)
- Health concerns (no radiation)

Calibration

- Instrument Calibration
  - verify instrument output is accurate
- Moisture Content Calibration
  - Manual
  - Automatic (MCA 1430 Drying Scale)

Instrument Calibration

- Optical two-way filter
- Traceability

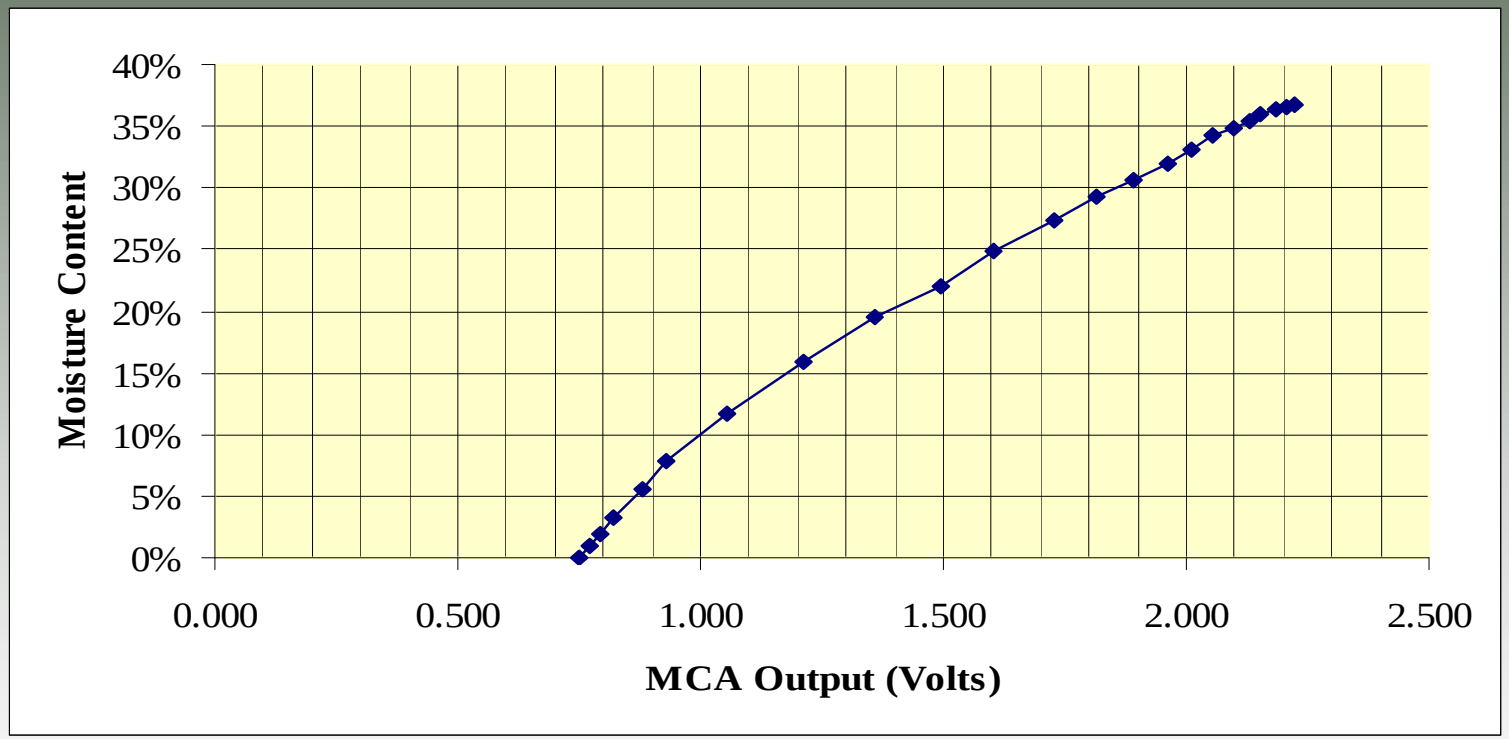
Automatic Calibration (%MC)

Automatic drying gives IR voltage as a function of moisture weight

Time	IR-voltage	Weight	MC (g)	MC%
0.1	**2.221**	**0.668**	0.246	36.8%
0.2	**2.206**	**0.666**	0.244	36.6%
0.3	**2.184**	**0.663**	0.241	36.3%
0.4	**2.154**	**0.659**	0.237	36.0%
0.5	**2.129**	**0.653**	0.231	35.4%
0.6	**2.096**	**0.647**	0.225	34.8%
0.7	**2.057**	**0.641**	0.219	34.2%
0.8	**2.013**	**0.631**	0.209	33.1%
0.9	**1.960**	**0.620**	0.198	31.9%
1.0	**1.890**	**0.608**	0.186	30.6%
1.1	**1.813**	**0.597**	0.175	29.3%
1.2	**1.726**	**0.581**	0.159	27.4%
1.3	**1.603**	**0.562**	0.140	24.9%
1.4	**1.492**	**0.542**	0.120	22.1%
1.5	**1.359**	**0.525**	0.103	19.6%
1.6	**1.214**	**0.501**	0.079	15.8%
1.7	**1.055**	**0.478**	0.056	11.7%
1.8	**0.929**	**0.458**	0.036	7.9%
1.9	**0.878**	**0.447**	0.025	5.6%
2.0	**0.821**	**0.436**	0.014	3.2%
2.1	**0.795**	**0.430**	0.008	1.9%
2.2	**0.773**	**0.426**	0.004	0.9%
2.3	**0.752**	**0.422**	0.000	0.0%

Moisture Content by weight and percent

Moisture Content Calibration



Output Data

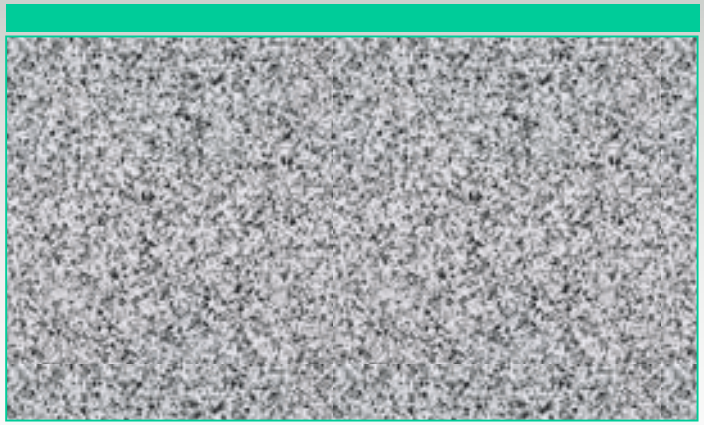
- Stability (typical ±2 mV)
- Resolution is 200 mV for 6%MC which corresponds to 0,03%/mV
- Continuous analogue output (0-5V)
- Real-time conversion to %MC

"Special Applications"

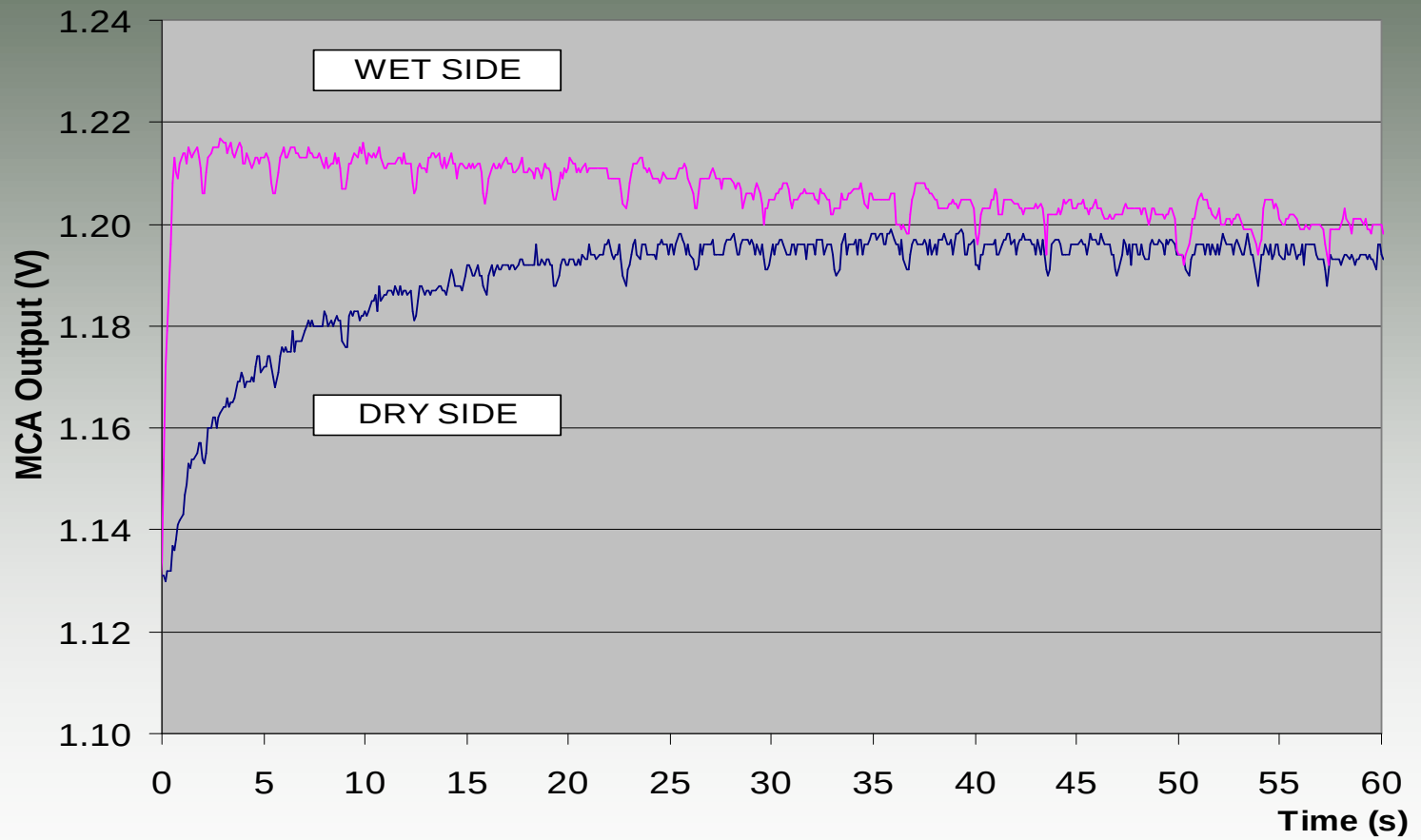
- Curing process of Gypsum plaster
- Water in printing inks
- Moisture penetration into liquid container board
- Moisture influence on "shelf life"
- Moisture gradients in Z-direction

Moisture in the Z-direction

- What is the moisture content in this structure?
  - The base paper is 100 µm thick and holds 4% moisture
  - The coating holds 32% moisture and is 10 µm thick

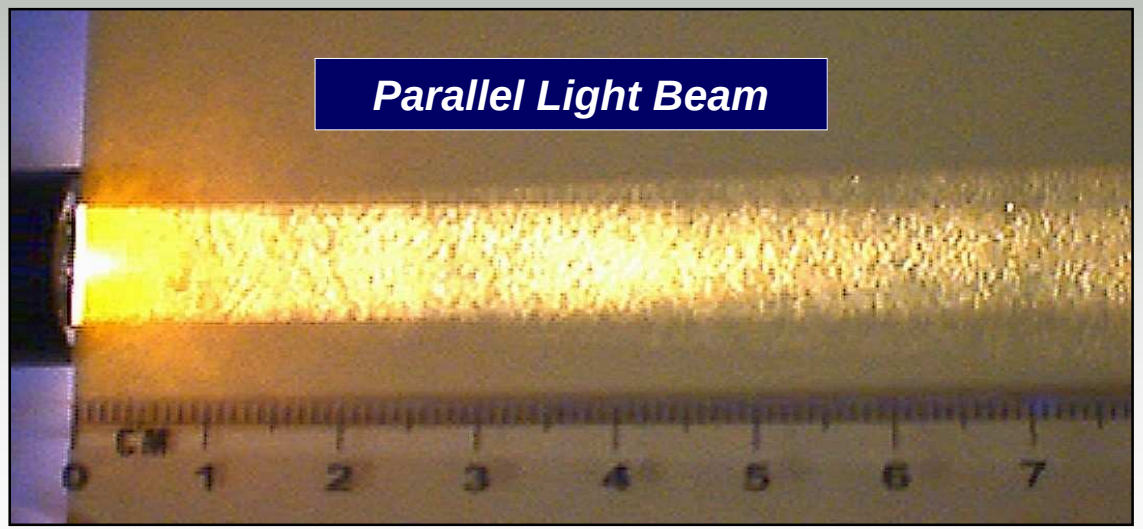


Moisture in the Z-direction



MCA "P-Beam" concept

- Lens can be fitted inside a ø12 mm pipe
- "Air-cushion" Lens
- Gives constant spot size for distances 5-50 mm



MCA 1490 Lens Head (Ø2,4 mm)

- Gives a light spot of 2,4 mm diameter
- For lab and on-line QC
- Applications
  - biosensor strips
  - tablets
  - welding rods

The MCA Moisture Sensors

FIBRO System AB, Sweden
Bernt Boström