FIBER OPTIC TRAFFIC SENSORS

Donald Halvorsen
Measurement Specialties, Inc.

Fred Motzko
Sensor Line

August, 2000
Sensor Line History

- Founded in 1996
- Spin-off from DaimlerChrysler (MBB)
- Located in Schrobenhausen, Germany (60 km from Munich)
- MSI is the exclusive distributor for the Americas
Capabilities

Airport Runway Sensor

Traffic Sensor

Railroad Sensor

Automotive Sensor
Fiber Optic Load Sensor

- Attenuation of light due to Microbending
- Light attenuation of 10-50% due to axle load
Airport Sensors

- First installations of prototypes at Zurich Airport in 1994
- Sensor lengths up to 6m (20’) and feeder cables to 400m (1,300’)
- Immune to EMI; Passive; Independent of Speed; Failsafe
- Verified and approved for aircraft ground control operations
- In active operation for Stop Bar Control since middle of 1999
Traffic Sensors

- Installed base of ≈ 1,000 sensors in Germany, France, Brazil, South Africa, Austria, etc.
- Mainly used for Speed Enforcement Cameras
- Manufactured for 3+ years
SPZ & SPT Fiber Optic Traffic Sensors

- Optical Fiber (230 µm) spiral wrapped on pentagon
- Sets in a “V” shaped elastomer profile
- Encased in polymer jacket
- Connected to optical fiber transmission cable
SPZ & SPT Fiber Optic Traffic Sensors

- Sensitive to vertical pressure only
- Flexible and elastic
- No metal parts
- Insensitive to environmental influences
- Wide operation temperature range
- Simple installation
Installation

Cut slot 15mm wide x ≈30mm deep (5/8” x 1 1/4”)

[Image of installation process]
Installation

Clean and dry road; place duct tape along edges
Installation

Pour small amount of SL Cast in the bottom of the slot
Installation

Place sensor into SL Cast; hold in place with wedges

Asphalt/Concrete

Embedding material
SL Cast-70

SP/SPZ - Traffic Sensor

ca. 30 mm

15 mm
Installation

Fill slot with SL Cast
Installation

When SL Cast is cured, open for traffic
SPZ & SPT Traffic Sensors

- Precise and Reliable Detection
- Wide Temperature Range
- High Sensitivity
- Immune to Road Noise
- Flush Installation
- Tolerant to Variable Installation Depth
- Elastic System -- Good Dynamic Range; Fast Response
- Excellent Mechanical and Chemical Resistance
SPZ Traffic Sensors

- Length: 2m to 5 m (6’ to 15’)
- Cable: 1m to 250m (3’ to 800’)

SPT Traffic Sensors

- Length: up to 5 m (15’)
- Cable: up to 3m (10’)

[Logo: Sensor Line]
Electronic Interfaces

**Common Features**
**MA-100, MA-110, & MD-200**

- Free of adjustments
- Uniform Trigger Level @ 1% light change
- Integrated LED Light Source
- Photo diode receiver
- Digital opto coupled outputs
- Inherent self-testing capability
Electronic Interfaces

**MA-100**

- Min of 13dB dynamic range
- 1 Channel interface
- Linear Output
- Min speed -- 1kph (0.6 mph)
Electronic Interfaces

MA-110

- Min of 23dB dynamic range
- 1 Channel interface
- Automatic Light Control - more fault tolerant
- Min speed -- 1kph (0.6 mph)
Electronic Interfaces

MA-200

- 2 Channel interface
- Works to “0” kph (0 mph)
- 10 dB dynamic range
- Flexible Output (RS232; Digital output)
- Optimized for toll applications
Applications

Speed Enforcement

Classification

Red Light Camera Trigger

Toll Treadles
Speed Enforcement

- 3 or 4 Sensors Used -- Double Measuring
- Timing between Sensors (Sensors 1m apart)
- Approved by PTB -- Accurate to better than 1 kph!
- Accurate even in noisy roads
Vehicle Classification

- Accurate speed → Accurate Classification
- No Bow Waves; Uniform Trigger
- Immune to any EMI! (Laughes at Lightning...)
- Install the Sensor over the Loop
Red Light Camera Trigger

- Work at any speed [stationary to 250(+) kph]
- Install the sensor over the loops -- small footprint
- Information specific to the vehicle
- Defined trigger point
Toll Treadle

- Any Speed -- DC to High Speed
- High Reliability -- No moving parts
- Solid State Electronic Trigger @ 1% Light Loss
- Immune to EMI
- Installs Directly in Road
- Compatible with toll system interfaces via MD-200