Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Measuring Technology for the Cement Industry

A step-by-step application guide from raw materials to final product

Endress+Hauser

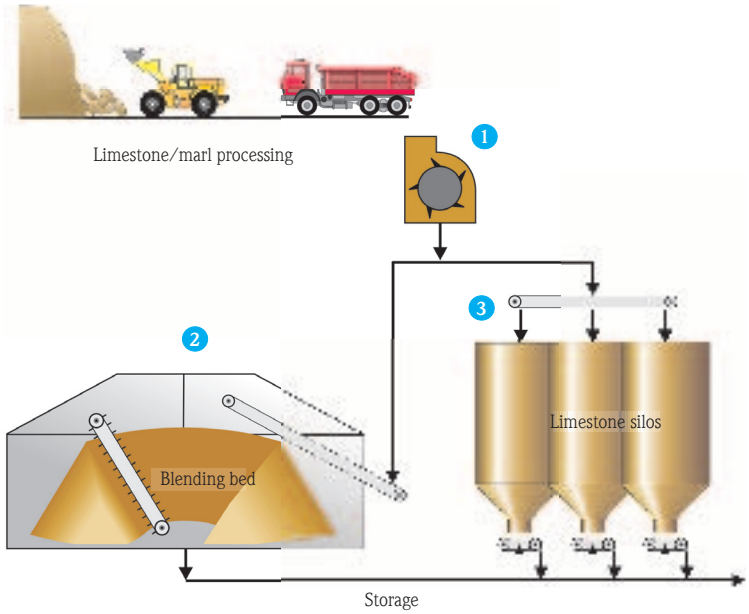
People for Process Automation

Raw material processing and preparation

Reliable measuring technology for your applications

The complete system for controlling a modern cement plant with integrated automation systems ensures increased product quality and efficiency while being environmental sound. Efficient information channels, process management, digital field bus systems and the sensors themselves are all becoming increasingly important.

The flow charts below of a cement plant describe typical applications and measuring tasks.



1 Feed bin and crusher monitoring

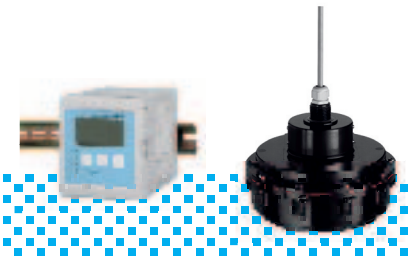
- Monitoring levels in feed bins with the **Prosonic S** ultrasonic measuring system
- Monitoring large rocks on the primary screen with **Prosonic T** and measuring conveyor load with the compact **Prosonic M** ultrasonic transmitter
- Detecting material back-up and idle running as well as regulating the open crusher using the **Prosonic S** (separate sensor and transmitter for control room or field assembly)

2 Blending bed

- Monitoring the discharge height of the stacker to control machine movement and reduce dust formation by using the **Prosonic S** ultrasonic measuring system
- Conveying system emergency switch-off with **Solicap M** capacitance rope probe as a compact or separate version with Nivotester FTC switching unit

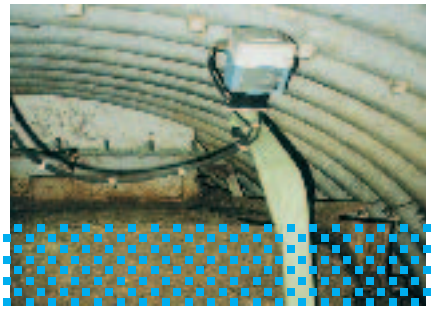
3 Silos for raw material

- Continuous level measurement using the **Prosonic S** ultrasonic measuring system
- Limit (maximum) detection with capacitance rope probes e.g. **Solicap M** compact transmitter



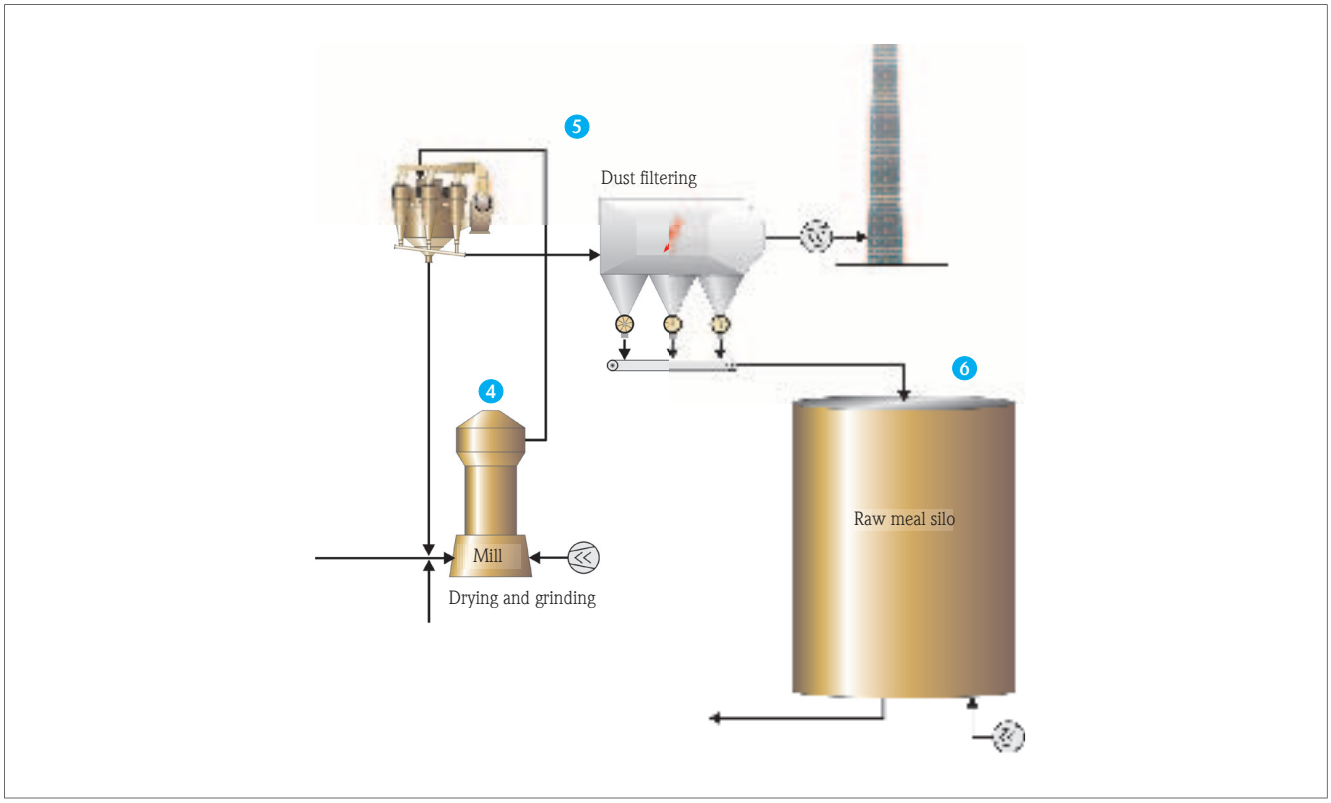
Continuous level measurement with **Prosonic S** (control room version and sensor)

Feed bin and crusher control with **Prosonic S** ultrasonic sensor



Monitoring conveyor transfer points with **Prosonic T**

Production and transportation of raw meal



4 Vertical roller mill

- Mill product load measurement with **Deltabar S** differential pressure transmitters
- Gas quantity measurement for drying the product with dp transmitters and **Deltatop** pitot tubes
- Additional pressure monitoring for mill hydraulic control with **Cerabar M**
- Water metering for cooling the mills with **Promag W** electromagnetic flowmeters

5 Electronic gas purification and electrofilter for dust extraction

- Capacitance limit monitoring of the outlets of the electrofilter with **high-temperature probes** (max. 400 °C/ 752 °F) or with **Gammapilot M** radiometric limit detectors
- Filter monitoring with **Deltabar S** differential pressure transmitters

6 Raw meal silo

- Level measurement in the homogenisation silo up to 80 m (229 ft) with the free space **Micropilot M** radar measuring system or alternatively with the **Silopilot M** electromechanical level system with umbrella weight
- Maximum level detection with **Soliphant M** vibration limit switches
- Air intake/fluidization monitoring with **Cerabar M** pressure transmitters

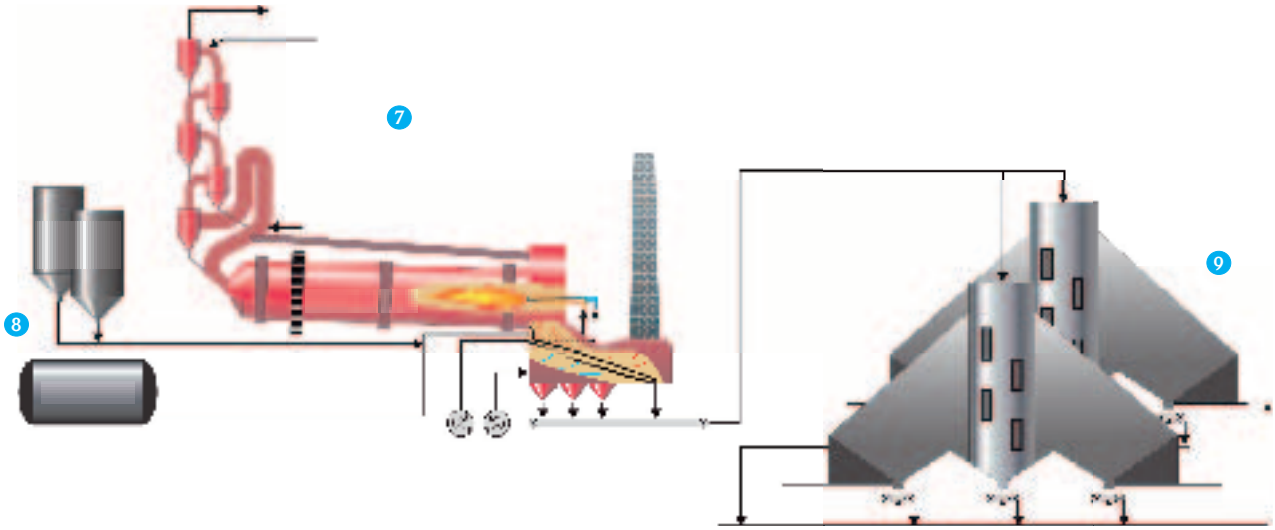
Measuring technology for air compressors , see Page 6

Limit detection in pneumatic pressure vessel with **Soliphant M**

Level measurement with **Micropilot M** radar measuring system

Continuous level measurement with **Micropilot M** free space radar

Clinker burner process



Cyclone preheater, rotary kiln and clinker cooler

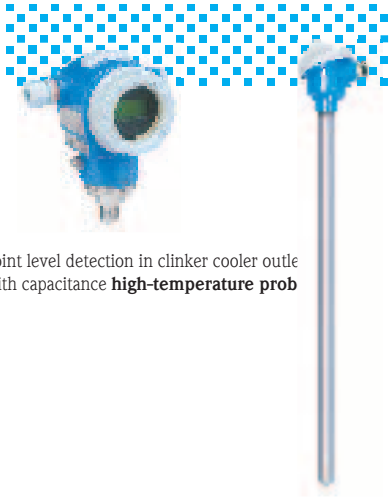
- Blockages in the cyclone are detected using the **Cerabar S** pressure sensor with dry ceramic measuring cell, with high overload resistance. As an alternative contact free **Gammapilot M** radiometric measuring system for continuous measurement of build-up
- Process temperature measurement with **Omnigrad S** syalon thermocouples
- Pressure drop measurement at rotary kiln head with **Deltabar S** differential pressure transmitters
- Limit monitoring at the cooler outlet funnels with capacitance **high-temperature Solicap S probes**
- Determining the mass flow of the clinker on the conveyor non-invasively with **Gammapilot M** radiometric measurement system

Fuel for the rotary kiln

- Oil tank level measurement with the **Micropilot M** free space radar measuring system or the **Deltapilot S** hydrostatic pressure sensor
- Mass flow measurement of heavy oil with the **Promass F** coriolis flowmeter and additional viscosity measurement with a **Promass I** (single-pipe version) for waste oils
- For coal level measurement in bunkers use the **Levelflex M** guided radar system; can also be used for secondary fuels such as solvents e.g. with rod or coax
- Limit detection of secondary fuels such as paper and cardboard or wood chips with the **Soliwave M** microwave barrier

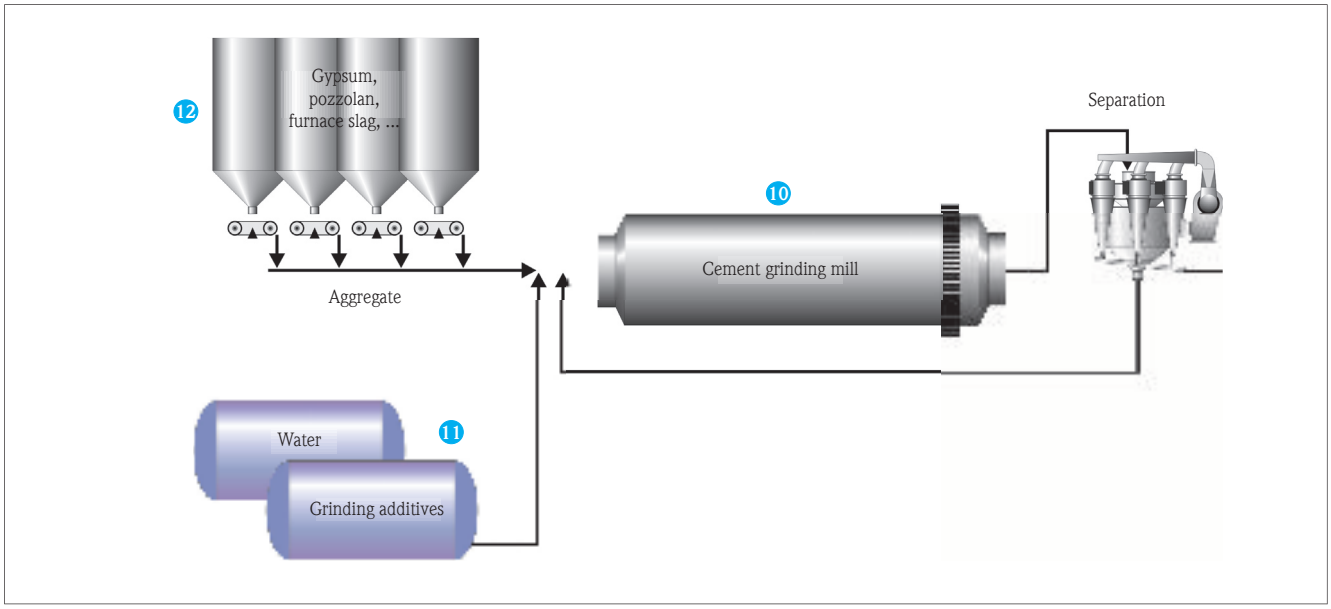
Clinker silo

- Continuous level measurement in clinker silos with the non-contact **Micropilot M** radar measuring device (max. 200 °C/ 392 °F at antenna); for greater distances, use the version with parabolic antenna.
- Point level detection with capacitance **high-temperature rope probe** (max. 400 °C/752 °F)



Point level detection in clinker cooler outle
with capacitance **high-temperature prob**

Cement production



10 Cement grinding plant

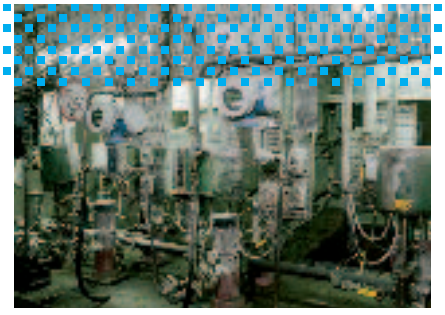
- Volume measurement of injected water for cooling the mills or metering the grinding additives by means of electro-magnetic flow meter with **Promag W**
- Compact temperature sensors **Easytemp** or **Omnigrad** with intelligent head transmitters, e.g. for monitoring the bearings and many other applications

11 Grinding aggregates storage

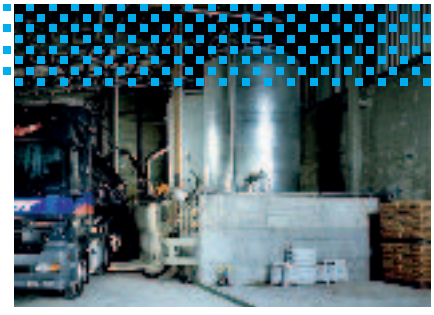
- Continuous level measurement in the tanks using **Liquicap T** capacitance probe
- Remote inquiry capability of data via Ethernet/Internet, WLAN, modem or GSM for direct inventory management with **Fieldgate**

12 Aggregate bins

- Continuous level measurement of gypsum, blast furnace slag or pozzolan for the production of mixed cements and other cements with **Levelflex M** guided radar devices
- Limit detection with the **Soliphant M** vibrating forks or the **Soliswitch** paddle switches in compact or rope versions



Flow measurement of grinding additives (in water) with **Promag W**

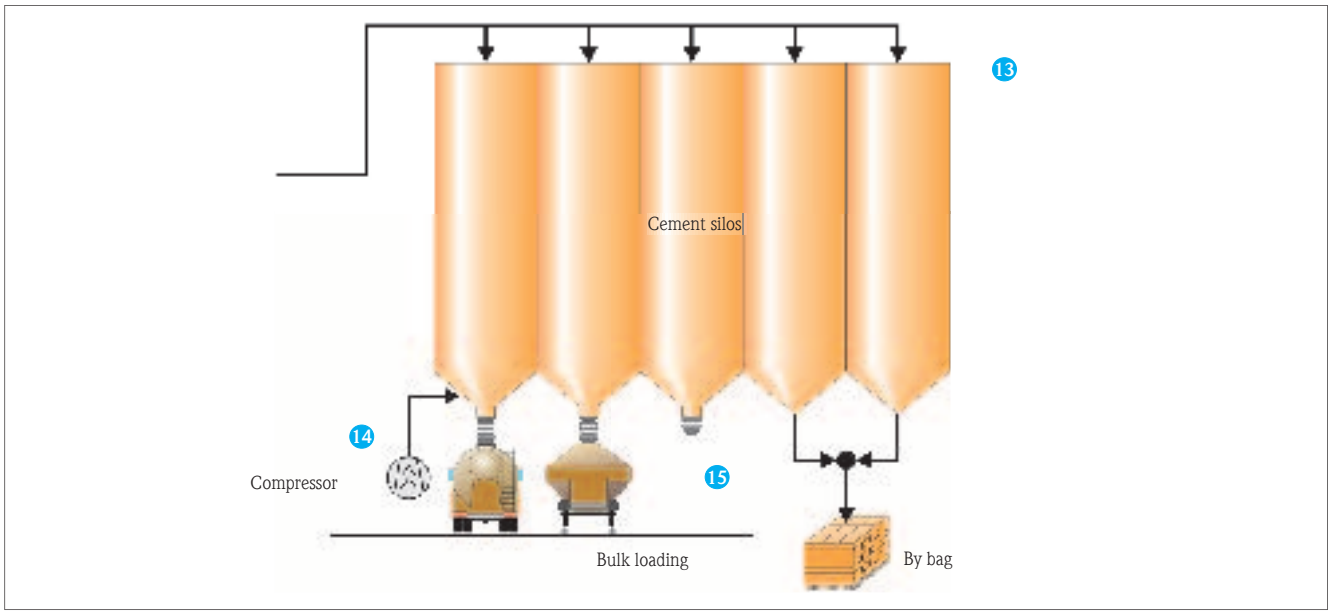


Continuous level monitoring of grinding additives with the **Liquicap T** capacitance probe

Liquicap T

Remote monitoring with **Fieldgate**

Cement storage and loading



13 Cement storage

- Continuous level measurement with the **Micropilot M** radar measuring system for heights up to 80 m (262 ft) or the **Levelflex M** guided radar for heights of up to 45 m (147ft) or alternatively with the **Prosonic S** ultra-sonic measuring system
- Maximum detection with **Minicap** capacitance probes with integrated automatic, active build-up compensation or alternatively with the **Soliphant M** vibrating forks

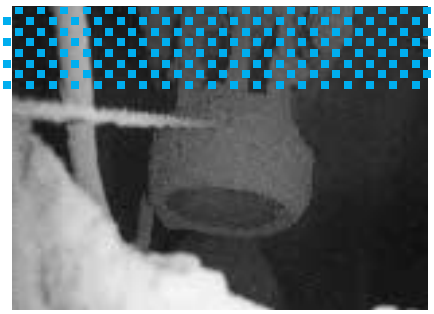
14 Compressed air generation

- Consumption-oriented control of compressors for fluidizing the cement silos (on/off during peak demands) by volume measurement with the **Prowirl** vortex flowmeter
- Monitoring of the cooling water circulation systems to increase availability and to prevent compressors overheating with the **t-trend** thermal flow monitoring system

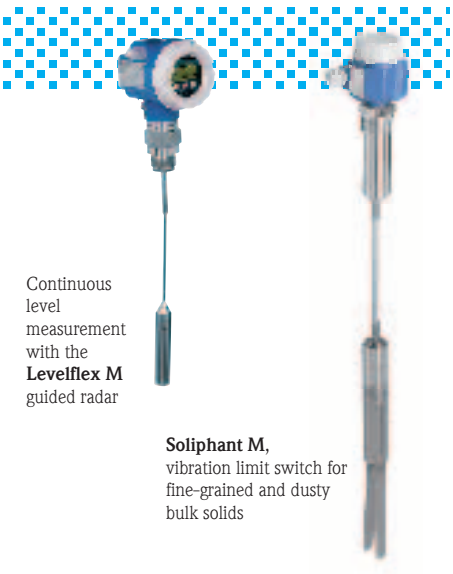
15 Packing and loading

- Minimum levels detection in the rotopacker with the **Soliphant M** pipe version or with the **Minicap** capacitance level limit switch for cement bag loading
- Level control or overfill protection during bulk loading wagons, trucks and ships for automatic switch-off with the **Soliphant M** vibrating fork installed in the loading telescope with protector and separate electronics– alternatively use the **Minicap** capacitance probe

Level detection in the loading telescope with **Minicap**



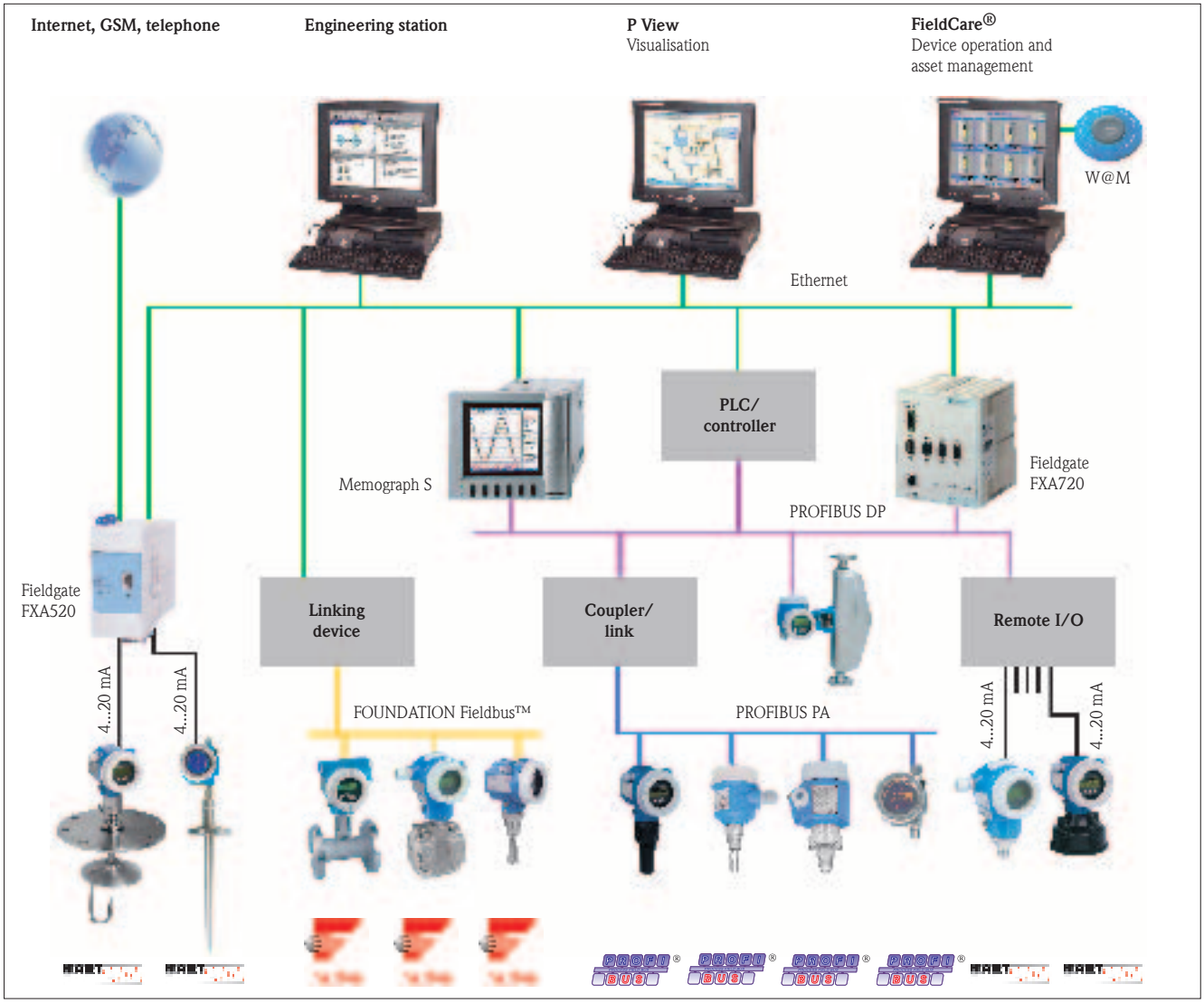
Prosonic S ultrasonic sensor with self-cleaning effect



Continuous level measurement with the **Levelflex M** guided radar

Soliphant M, vibration limit switch for fine-grained and dusty bulk solids

Cement works – field communication



PROFIBUS PA/DP and FOUNDATION Fieldbus™

PROFIBUS® and FOUNDATION Fieldbus™ are open fieldbus standards. They have been specially designed for process engineering and process automation purposes.

Endress+Hauser offers PROFIBUS® and FOUNDATION Fieldbus™ instruments for level, pressure, flow, liquid analysis and temperature measurement as well as recording devices.

Advantages:
- Standard is not dependent on a particular manufacturer
- Communication and power supply using two-wire technology
- Flexible topologies and bus structures

HART® protocol, e.g. via remote inquiry

In process instrumentation, the HART® protocol has become the standard for SMART transmitters world-wide. Together with a **Fieldgate**, the HART® protocol offers remote inquiry capability, remote diagnostics and remote programming. To this end, the **Fieldgate** uses the existing infrastructures of the Internet and software standards. Every Internet-compatible computer can request and represent measured values world-wide without any additional software.

The **Fieldgate** offers transparency in production and supply processes and opens up new possibilities in inventory management – e.g. time and cost optimized route planning for delivery vehicles.

Visualization and device configuration

The **P View** visualization system is a high-performance and price-effective customer solution for process visualization. Measured tank values such as level or temperature are clearly depicted.

FieldCare® configuration and asset management software is based on the open FDT 1.2 standard (Field Device Tool) and provides easy access to field instruments from a central station irrespective of the manufacturer. **FieldCare®** comprehensively supports engineering, configuration or setup and diagnosis of intelligent instruments. **FieldCare®** makes an engineer's life easier, e.g. from quick access to device manuals through to plant wide status monitoring of all field instruments.

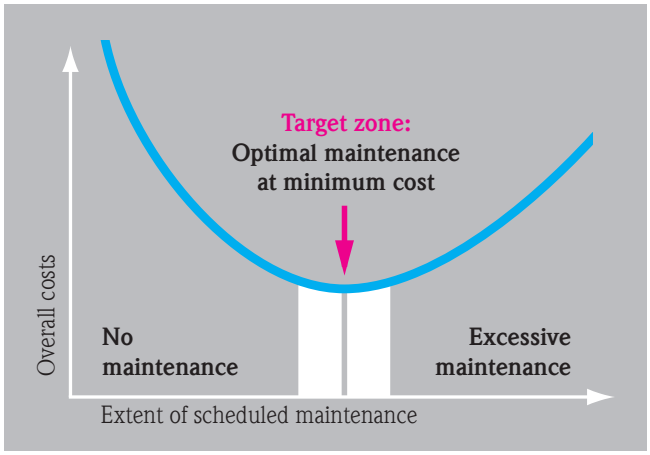
Your one stop process automation shop

Consultation, implementation and support of measuring and automation systems for the cement industry

Optimized maintenance programs

Endress+Hauser maintenance and support programs aim to improve plant reliability. To this end, we work together with your maintenance staff to define relevant service intervals, schedules and procedures and the allocation of respective resources which best suit your plant. This maintenance strategy is based on an assessment of overall process instrumentation and takes in to consideration all systems and procedures relevant to quality and safety.

Our tailored support programs always take into consideration our customers' specific work processes and methods, the local technologies, as well as the experience and know-how of engineering staff. As a matter of course our service schedules and support measures will address your financial constraints and company.



«Too little maintenance» is just as critical as «too much» – Endress+Hauser helps you to find the right balance.

Co-operation and partnership

From consultation and commissioning through to operation.

Endress+Hauser is with you during the whole process as your partner in industrial instrumentation and plant asset management. The responsibility of Endress+Hauser does not end with instruments. We assume the overall responsibility for your plant. Be it fieldbus installation, remote instrument visualization, automation of processes or the realization of asset management installations – all of this is engineered by a partner you know well.
Our consultation services aim to provide the following:

- Cost reduction solutions by decreasing raw material and energy consumption as well as maintenance and down times
- Higher safety and fewer plant down times
- Solutions for a broader range of applications with fewer stocked instruments

Additional documentation

Product and service documentation

- System components FA 016K
- Process Solutions FA 001S
- Service portfolio FA 018H
- Inventory control – Transparency in your bulk inventory to optimise your business FA 003V
- W@M – web-enabled Asset Management supporting your business CP 001Z
- Measurement Selection Aid for Bulk Solids SO 404B

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