

Technical Support

For applications assistance contact the Teledyne Cormon Products Group. Field installation, commissioning and support services are available from our Service group.

Technical references:

NACE EXPO New Orleans 2004 Conference paper 04362

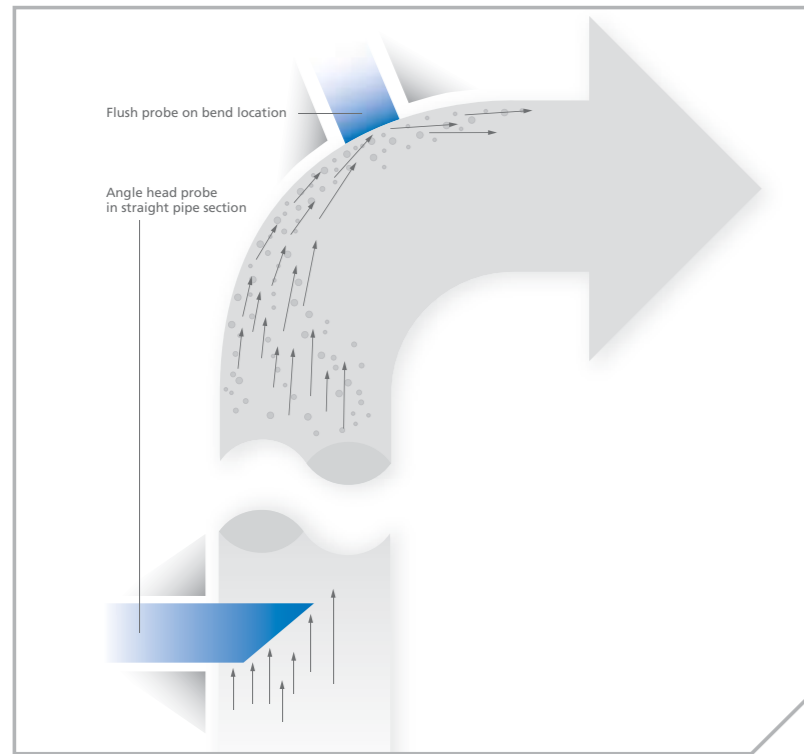
Studies of inhibition and monitoring of metal loss in gas systems containing solids.

T Evans, H.Bennett, Y.Sun, J Alvarez, E. Babaian-Kibala BP Exploration Operation Co. & J W Martin, BP Amoco

NACE EXPO New Orleans 2004 Conference paper 04355

A comparison of monitoring techniques for improved erosion control: a field study

W. Hedges - BP Trinidad & Tobago, A. Bodington -Concepts & Services Co Ltd.



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TELEDYNE CORMON LIMITED

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SAND EROSION MEASUREMENT



For the proactive management of produced solids

Sand erosion management and production optimisation

The technical and commercial threats posed by solids produced from the reservoir formation are well known to Oil & Gas Operating Companies and Asset Managers. Proactive strategies are required to manage the impact of these solids on production and to maximise productivity.

Solids production is typically episodic and can cause extreme damage almost instantaneously. The consequences can include reservoir damage, erosion of choke valves, erosion and accelerated corrosion of pipework, reduction of corrosion inhibitor performance and the filling of Separators: all resulting in reduced productivity. Reliable instantaneous management of solids in offshore and subsea systems is of vital importance.

Teledyne Cormon offer state of the art measurement products and advocate an integrated measurement and control approach to solids management by providing direct-correlation tools between process measurement (volumetric flow and velocities, choke position, chemical inhibition-rates, pressure

and temperature) and real-time intrusive erosion & corrosion measurement of particle impact effects. These are then linked to alarm management functions. This facilitates an instantaneous response to solids production thereby mitigating damage. The approach also provides the platform for the development of reliable empirical models/algorithms for the trending of the reservoir behaviour and establishing safe operational limits in terms of erosion damage. Teledyne Cormon PTEC™ range products provide options for Pressure, Temperature, Erosion or Corrosion measurement in a single probe (see data sheet CMEP023).

Teledyne Cormon Sand Erosion Probes can detect the minute quantities of material lost due to the erosion effects of the impact of entrained solids. Teledyne Cormon's unique CEION® metal loss measurement technology has exceptional resolution and extended sensor life giving both high sensitivity to erosion and low cost of ownership. Field applications have documented the very high sensitivity of the probes to particles of all sizes, ensuring that low velocity fines for example, undetectable by acoustic methods, can be measured. (See references overleaf).



A range of Sand Erosion sensors for all conditions: deepwater HP / HT to low pressure process pipework.

- ☉ PTEC™ High Pressure / High Temperature Subsea Probes with integral measuring electronics providing very long life, high resolution, temperature and pressure measurement and a flexible communications module for integration with equipment from all major Subsea Control Module suppliers including SINS Level II compliance.
- ☉ PTEC™ Topsides High Pressure / High Temperature Probes for applications in the wellhead area requiring compatibility with HP shut-in conditions. Separate electronics package.
- ☉ Topsides High-Velocity Probes for applications in wellhead and processing areas up to Class 2500#.
- ☉ Standard process pipework probes for medium / low velocity applications (below 5 m/sec) at Class 1500# and below.

Note: For projecting angle head designs there may be an upper limit on velocity due to wake frequency considerations

Method

A probe is positioned in a pipeline relative to the flow so that the solids bearing portion of the production stream contacts the sacrificial Sample Element causing erosion. The loss of as little as 5 nanometers of material can be detected. The probe is either placed on a bend (flush head) or at an angle to the flow that simulates a bend/process stream interface (angled head). See diagram p4.

The thickness of the eroding element for HP/HT designs is up to 8mm (AC series probes up to 2mm). The high resolution of CEION® technology permits the use of thick elements without loss of usable resolution to greatly extend service life and reduce replacement costs, even for applications with severe erosion characteristics.

In addition to metal loss readings, the probes also measure temperature, a useful process parameter which is also used when compensating for the effects of temperature change on the measurement. The calculation and compensation is performed automatically

in the instrumentation. This capability prevents the reporting of false erosion events caused by temperature changes in the process stream and is far more efficient and effective than the use of separate temperature sensor information. The temperature value forms part of the instrument output and serves the additional purpose of providing a health check on the probe. Pressure measurement is provided as an option on PTEC™ designs.

Element material selection

The erodable Sample Element of the probe may be made from a wide range of material according to the requirements of the application. For monitoring erosion of alloy steel pipework, the element is usually made from the same alloy material. For erosion in carbon steel pipework and general applications Inconel 625 is recommended. For erosion / corrosion applications, such as inhibitor efficiency testing, the element is usually a carbon steel. (See below for technical advice contact information).



AC Series topside designs may be ordered using the product code builder:

CPM	AC				
CEION® probe with configuration module	High pressure access fitting - head diameter 32mm	Length Insert required length in mm - 3 digits	Style IM Angle head - high velocity, masked FM Flush - high velocity, masked IA Angle head - low velocity epoxy face FL Flush - low velocity, epoxy face	Element thickness 040 0.040" - 1mm 080 0.080" - 2mm 160 0.160" - 4mm	Element material B24 Inconel 625 B09 Duplex St Stl A07 Carbon Steel PSM Purchaser Supplied Material

Select code option from list and write into boxes above to create a unique product code: e.g. CPM AC 125 IM 080 B24
NOTE: All AC series probes are limited to 140°C (284°F) max. Body material is 316ss

Probe Ordering

PTEC™ HP/HT subsea and topside designs are produced against an agreed Tag Data Sheet stating all of the process and performance parameters, materials, data and communications specifications etc. For advice or a template please contact Teledyne Corrom Sales. Typical operating range: 0 to 15000psi (1034 bar), -70 to +200°C (-94 to +392°F).

See also Product Data Sheet CMEP023.

Length Calculation

AC Series probe lengths are calculated as follows:

Standard 133mm (5.25") access fitting: Flush length = pipe wall thickness plus 61. For other fittings add 25.4mm per inch of additional height.

Flanged access fitting: Flush length = pipe wall thickness plus stand off pipe OD to top of fitting -71

Angle head probes: Use the flush calculation method. Datum point is centre of angled face - probe tip is 16mm past datum point. Add required intrusion distance over flush, in millimetres, to flush length.

Instrumentation

Subsea probes have measurement and communications electronics mounted in an integral pod rated for 2000m water depth or deeper. Connector specifications and communications protocols (Modbus, Profibus, CanOpen etc.) are agreed for each individual application. Probes are usually hooked up to client Subsea Control Modules.

Topsides probes have separate CEION® instrument packages in the form of ATEX / UL / CSA certified IS transmitters in stainless steel IP67 housings. A barriered 24v dc power supply and a 3 core data link are required. For product order codes see data sheets CMEI 021 & 017.

Data from CEION® transmitters may be handed on to safe area devices in a range of configurations including RS232, RS 485 and 4-20 mA plus a range of protocols including Modbus. Instrument outputs are in engineering units – metal loss (mm) and temperature (°C).

For an integrated data solution proposal please contact our Products Group.

