A multipoint sensor allows the measurement of a temperature profile across a large area. Thermocouples or RTDs are arranged with measuring junctions at various points along a pipe, allowing the measurement of various points from a complete assembly. Many elements can be spaced along a probe.

This opens up possibilities for improved profiling in reactors, for example, where flow interference prevents inserting large numbers of individual probes. Multipoint probes can also be used to give a temperature profile where stratification of a tanks contents may be of concern. JMS will custom design your assembly to give you the most accurate temperature measurement for your process.

The following information and/or drawing is needed to properly design your assembly:

- Thermocouple calibration or RTD element type,
- Outside diameter of pipe and pipe material,
- Junction style of thermocouple,
- Sensor material (bare wire, 316 SS tubing, or sheath material),
- Overall length of the entire assembly,
- Process connection,
- Accuracy required,
- Cold-end termination,
- Maximum operating temperature.

JMS will generate a drawing for your assembly.
**MI CABLE DESIGN AND CONSTRUCTION**

**DESIGN**
- CenterPoint MI cables are 0.070” thick, double-wall design with a 5/16” sheath O.D.
- First wall is 0.035” overlapping second wall of 0.035”
- Second wall acts as a flexible protective Thermowell wrapped around a flexible heavy walled thermocouple
- Single CenterPoint MI cable can house 19 points of temperature indication, greatest in the industry
- CenterPoint sheath materials are available in any metallurgy
- Thermocouples are available in any calibration
- A single CenterPoint assembly can be designed for complete coverage of a single catalyst bed

Each CenterPoint assembly is custom designed to meet the specification of the Process Licensor, Engineering Company and End User

**CONSTRUCTION**
- Double wall construction allows the MI cable to be welded to the flange face without damage to the cable caused by localized heat buildup during the welding procedure
- Drawing and Annealing sheath material provides a flexible housing for the thermocouples
- Restricting process flow (should the sheath integrity become breached) is tightly packed Magnesium Oxide insulation
- No special tools necessary for making long bends
- Tubing benders required for tight radius bends

**COLD END DESIGN**
- Pressure gauge directly tied to flange penetration creating secondary safety system
- Eliminates the need for additional welded or flanged safety chamber
- Reduced flange face penetrations maintains flange integrity
- Double block and bleed valve designed to bleed off trapped hydrogen or process fluids
- Each junction is equipped with a 10,000 psi pressure fitting,
- All welds are full penetration welds

CenterPoint provides optional secondary containment chambers available to meet the design needs and specifications of the customer

**DIAGNOSTIC SYSTEMS**
- Is process flow distribution a problem?
- Are quench zones working properly?
- Are new distribution trays necessary?
- Is process channeling occurring?
- Does the reactor exhibit areas of localized catalyst coking?
- Are heat related problems causing out-of-specification products?
SAFETY BENEFITS

- **Rapid Speed of Response time:** Real time temperature measurements
- **96% of a 100 degree step change in 3 to 8 seconds**
- **Eliminate temperature excursions on high temperature, high pressure**
- **Radial spread determines “hotspot” locations near reactor walls**
- **Reduce/ replace many reactor skin thermocouples**
- **Can be tied into the EMS system**
- **Redundancy – A duplicate sheath can be installed alongside the original at time of installation**

Can put as many temperature sensors into the reactor bed at any discreet point location in the catalyst bed where you want “real-time” temperature indication.

PROCESS BENEFITS

- **Greater process control**
- **Increased productivity on conversion reactors**
- **Flow distribution monitoring**
- **Creating a complete horizontal and vertical temperature profile**
- **Determining any process channeling**
- **Eliminating “blind spots”**
- **Eliminates low pressure areas around pipewells**
- **“Mirror image” thermocouple pattern creates a complete horizontal & vertical temperature profile**
- **Help determine the necessity of new reactor internals (i.e. distribution trays, quench zones)**
- **Monitoring optimum regeneration on naphtha reforming catalyst**
- **Finding localized “hotspots” in the catalyst bed**
- **Monitoring catalyst temperature during critical Startup Procedures**

Greater temperature control means increased production on conversion units such as Hydrocrackers, Naphtha Reformers, Dewaxing Units and Styrene Monomer Units

PROCESS LICENSORS

- **Reduced number of nozzles and size**
  - **Reduces cost of manufacturing**
  - **Reduced number of penetrations**
  - **Less Exposure risks**
  - **Increased structural integrity of reactor**
- **1” nozzle: 48 temperature indication points**
- **Enhanced operational information and process control of unit**
- **Eliminates large bundles of Thermo-couple cables and pathways for process flow that they can create**

ENGINEERING COMPANIES

- **Reduced number of nozzles**
  - **Locate nozzles on one side of reactor for ease of design and maintenance**
  - **Reduced cost compared to flexible thermocouple technology**
  - **Increased number of temperature points**
  - **Reduced installation cost**
  - **Eliminates expensive cranes used to install pipewells**
  - **Reduced number of MI cable reduces assembly cost**

END USERS

- **Reduces the overall cost of building**
  - **Often times can install 3 times as many TI points for the same cost as using traditional thermometry**
  - **Ease of catalyst loading and unloading, system stays in place and will not interfere with dense loader**
  - **No removal / replacement of horizontal pipewells when loading catalyst**
  - **Will not create a “shadow” side on back of pipewell when loading catalyst**