



# GE Sensing Solutions for Delayed Coking

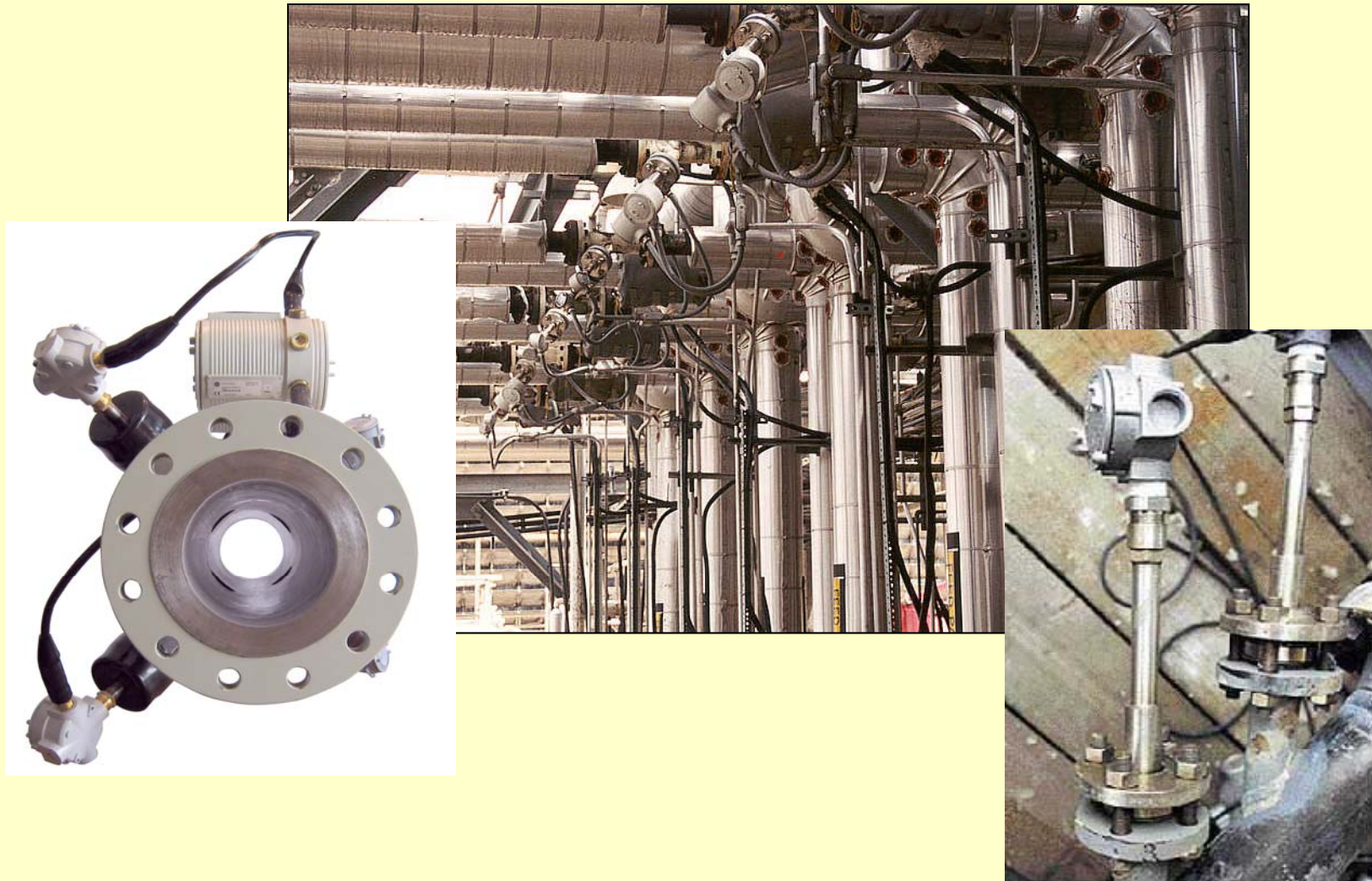


**Coking.com**  
MORE PRODUCTION - LESS RISK



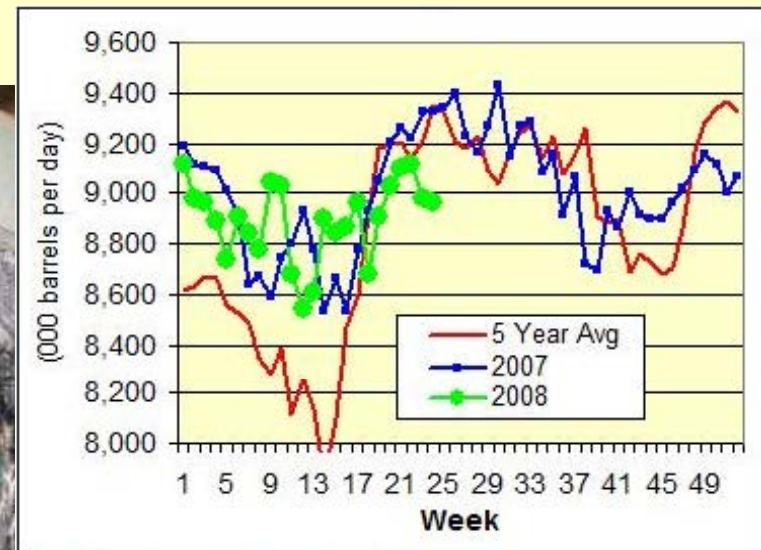
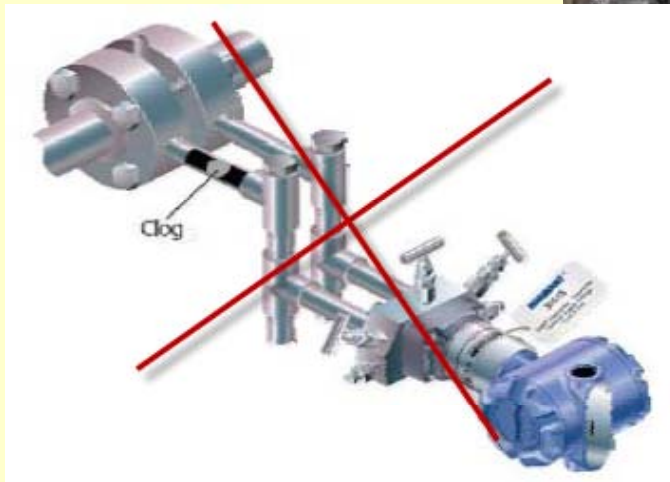
# “Bundled Waveguide Technology”

**RELIABLE & ACCURATE** Feed Flow Measurements



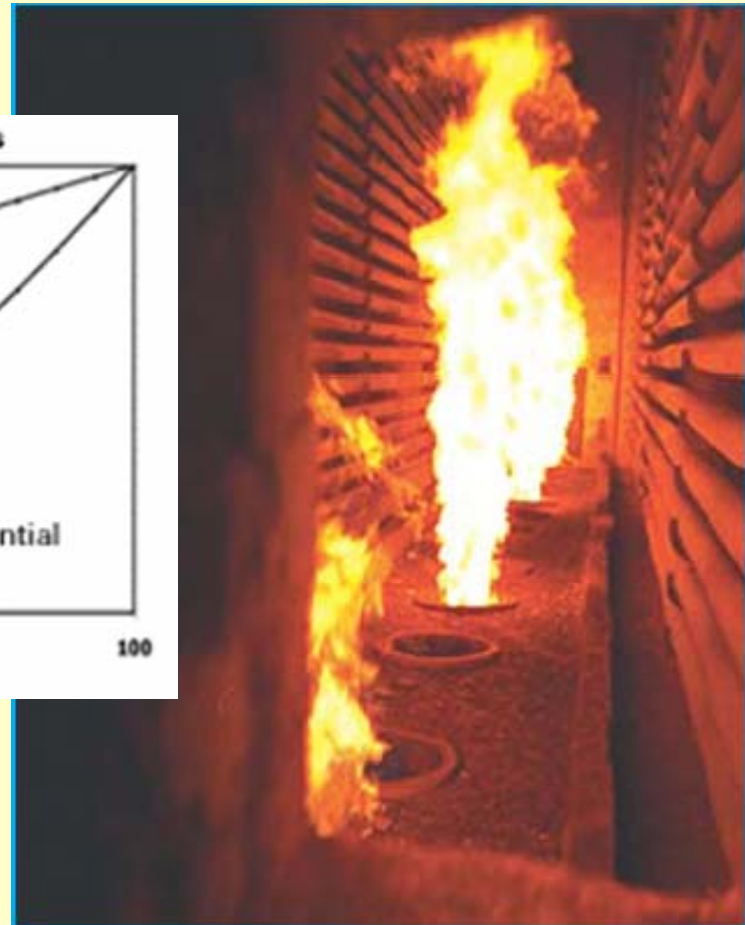
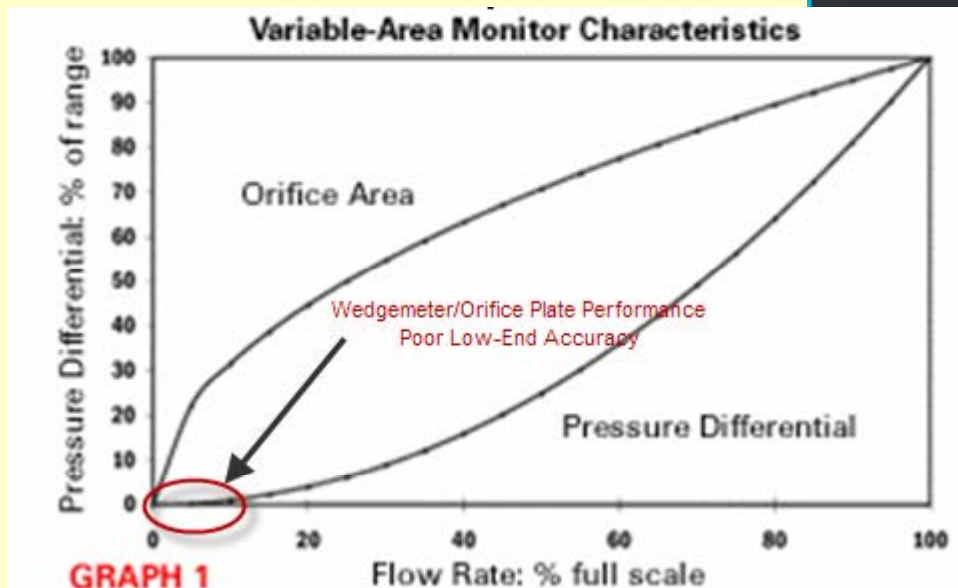
# More **RELIABLE** Feed Flow Measurements

- Provide Dependable Feed Flow Rate Information
- Provide a Safer Environment
- Reduce the Risk of Furnace Trips
- Prevent Product Loss



# More **RELIABLE** Feed Flow Measurements

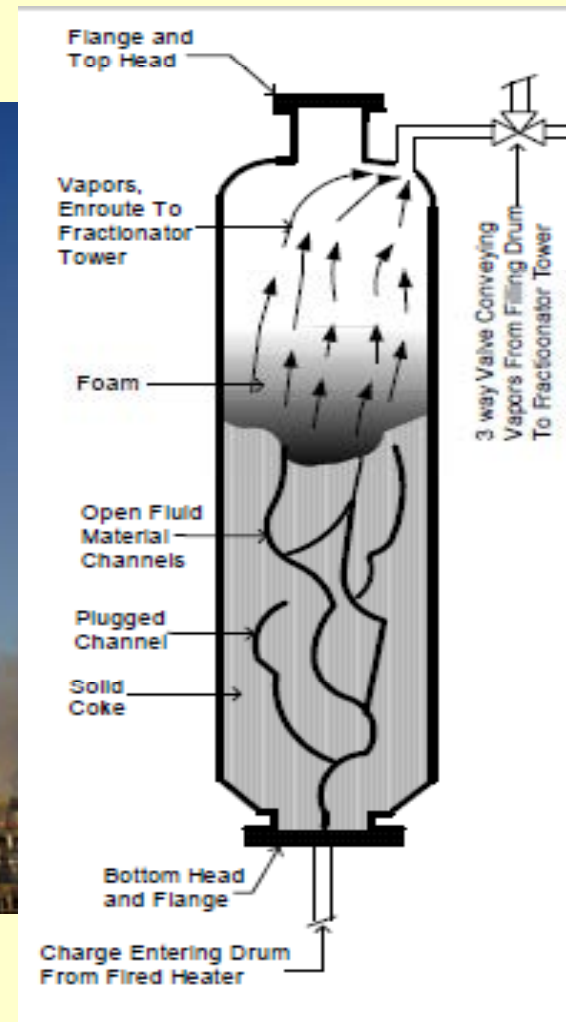
- Improve Low-End Reliability during Startup & Shutdown
- Reduce the Risk of Fire & Equipment Damage
- Safer Unit Operation
- Increase Production





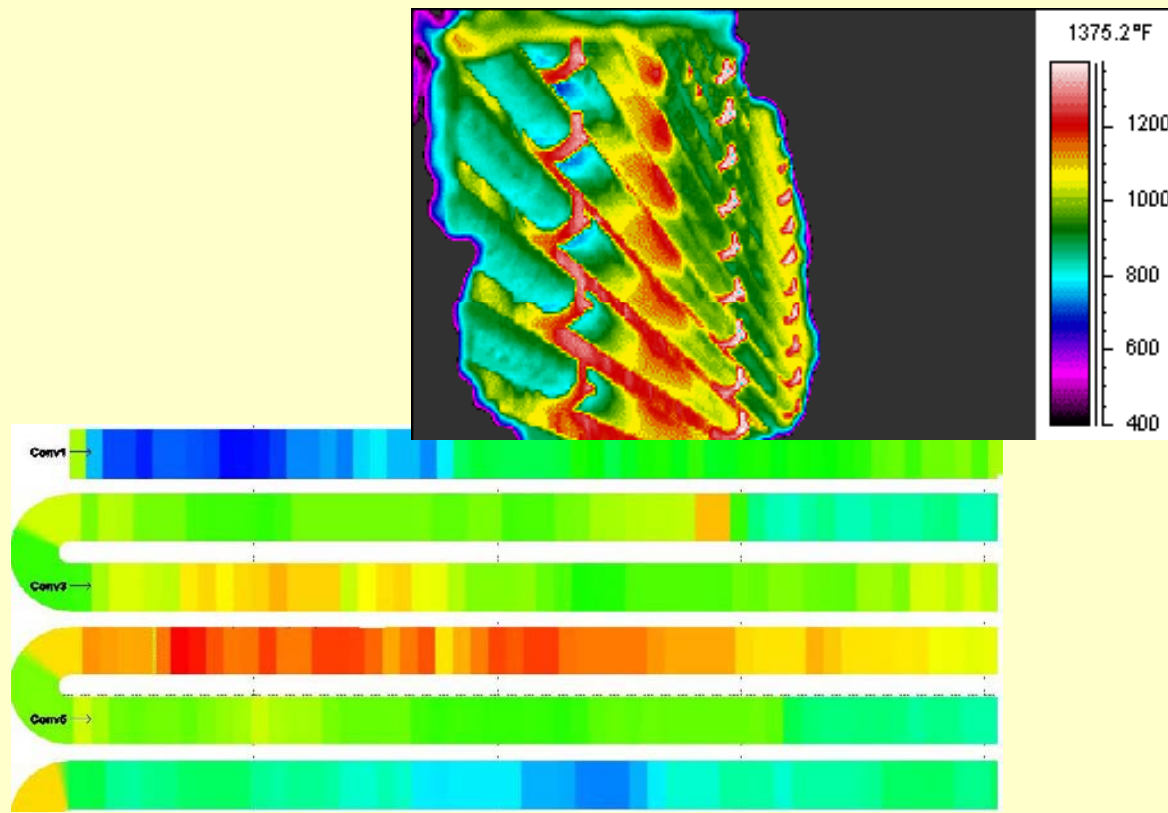
# More **ACCURATE** Feed Flow Measurements

- Optimize Furnace Load Balancing & Zone Flooding Control
- Improve Control of Drum Fill Times



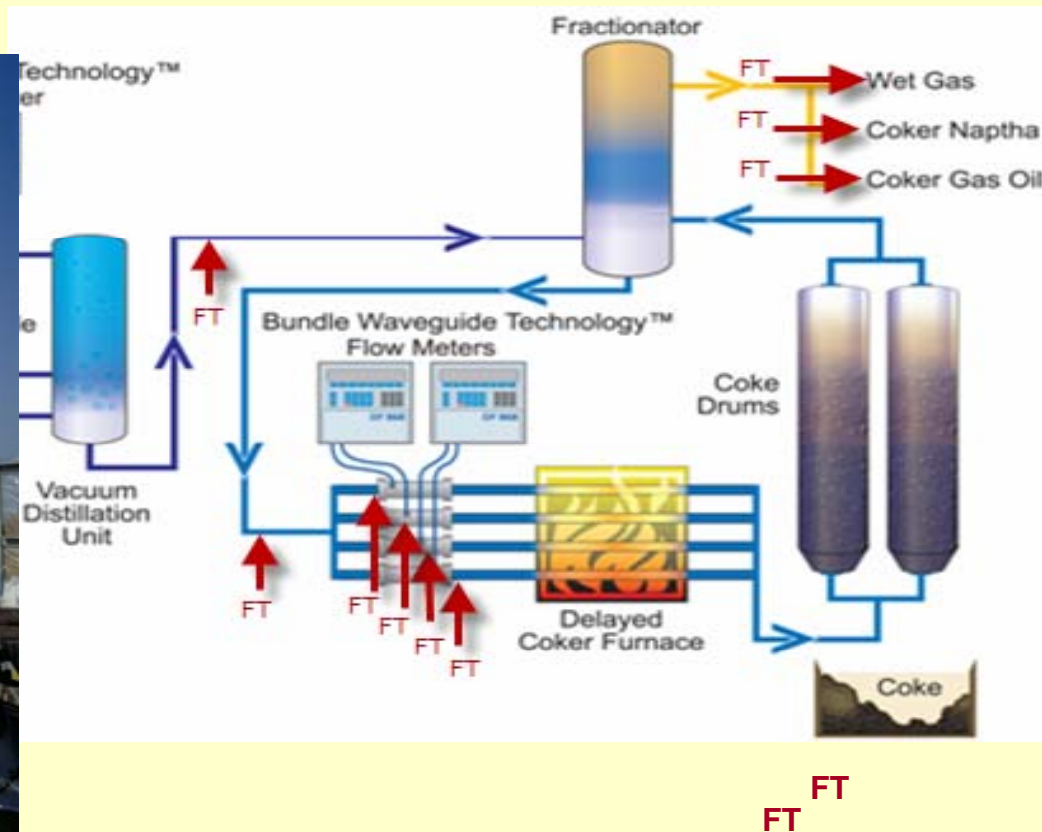
# More **ACCURATE** Feed Flow Measurements

- Efficient Application of Velocity Steam
- Reduce Tube Fouling Rates
- Reduce Tube Bend Wear
- Increase Heater Run Lengths



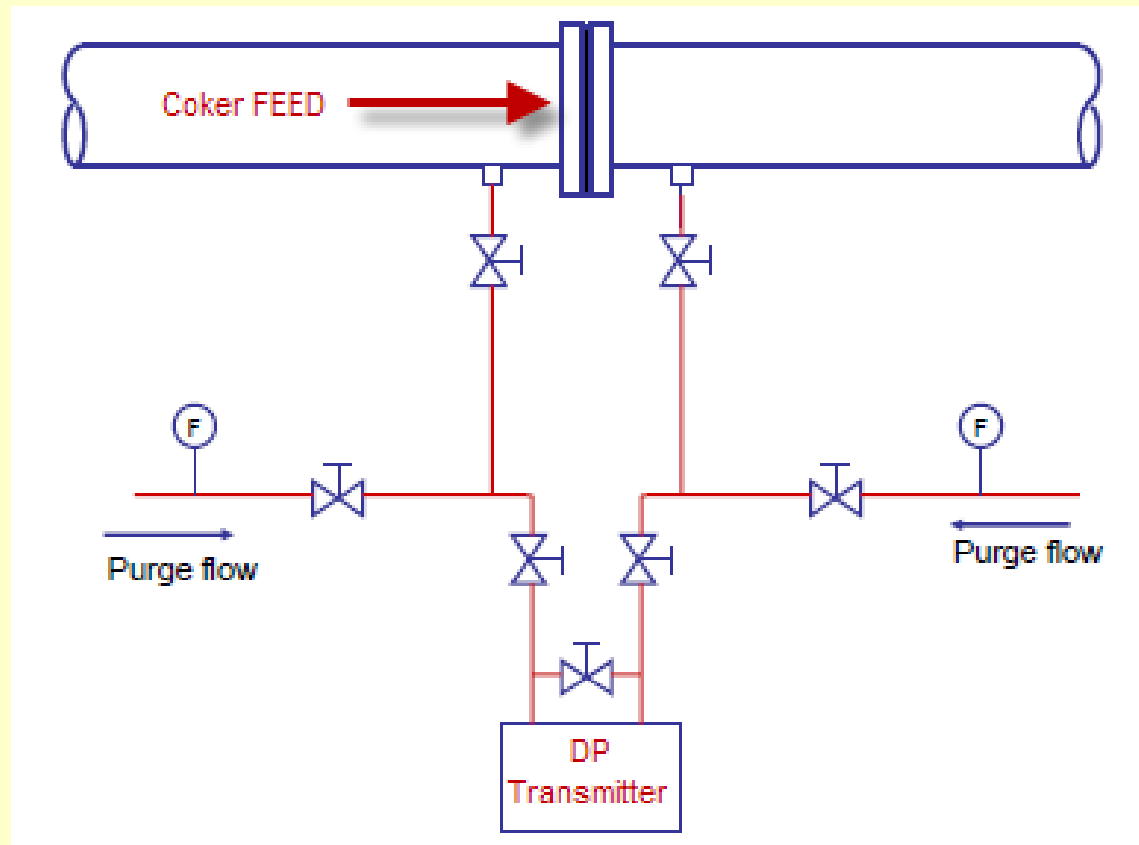
# More **ACCURATE** Feed Flow Measurements

- Improve Mass Balance & Recycle Rate Accuracy
- Provide Accurate Measurement of Unit Productivity



# Increase Delayed Coker Capacity

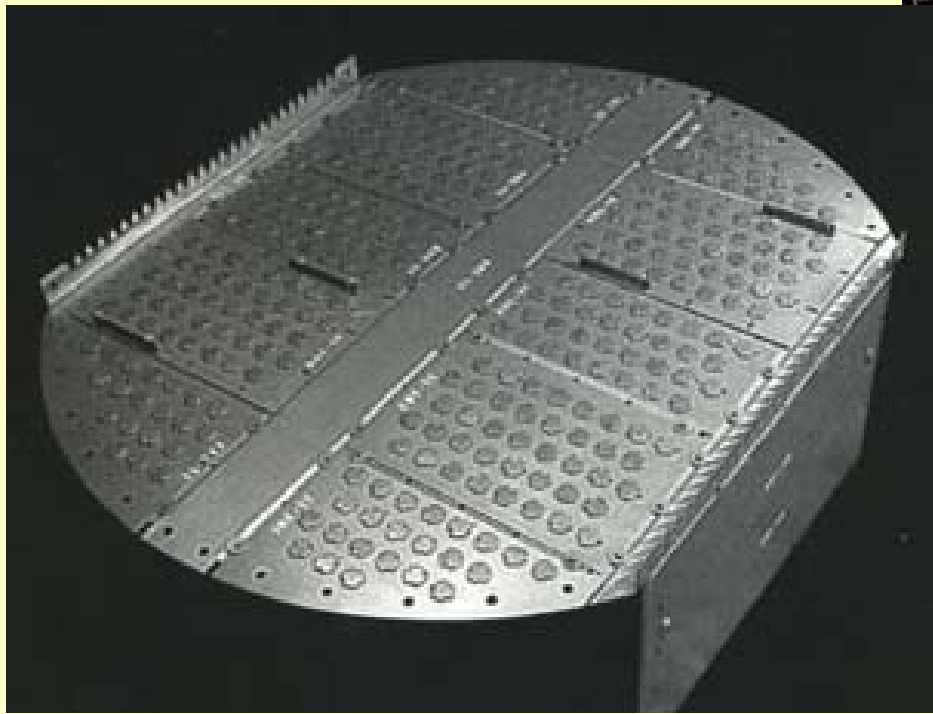
- Eliminate DP Impulse Lines
  - Injecting Purge Fluid, Reduces Unit Capacity
  - Product Loss (Purge Fluid/HCGO) is not 100% Recoverable





# Increase Delayed Coker Productivity

- Reduce Tray Temperature Control Span  
(More Accurate “Pump-Around” Flow Measurement Accuracy)
  - Improve Boiling Point Control
  - Increase Yield
  - Reduce Recycle Rate



## Reduce Maintenance Man Hours

- Reduce Exposure Time in the Unit & Risk of Injury
- Reduce Maintenance Man Hours Cost



# The Solution?

Bundled Waveguide Technology  
(Sensor Type)



+

Ultrasonic “Transit Time”  
(Flow Measurement Technology)

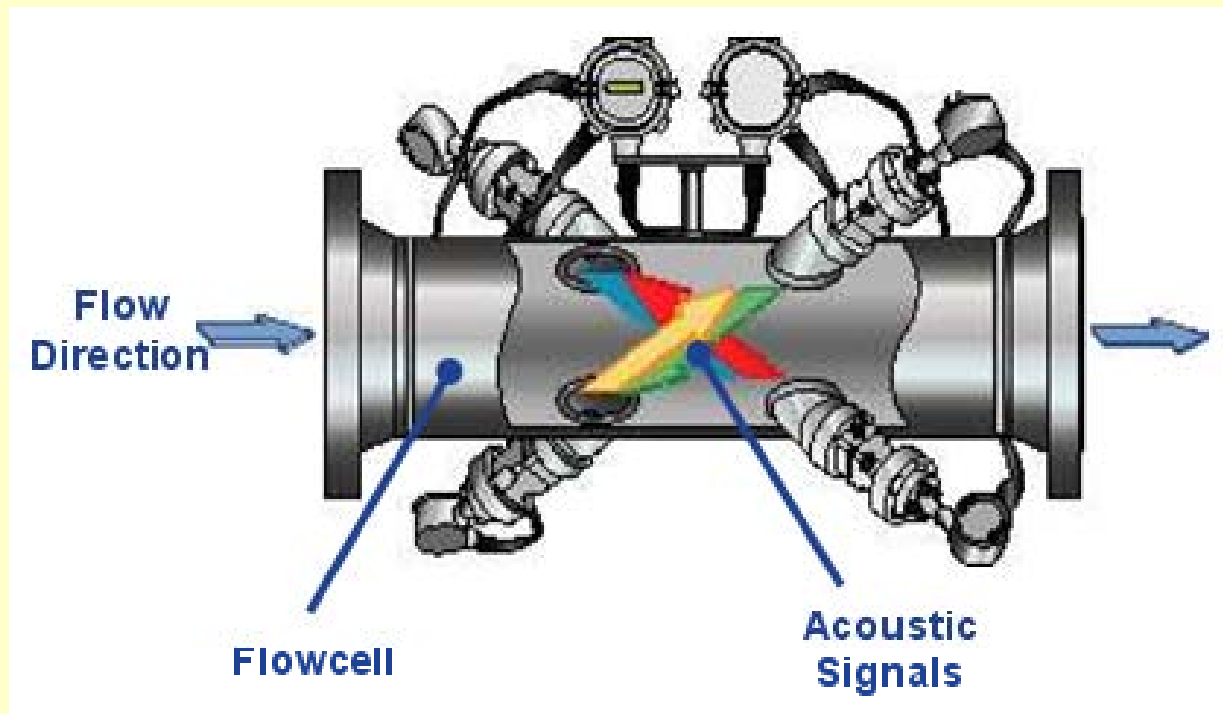
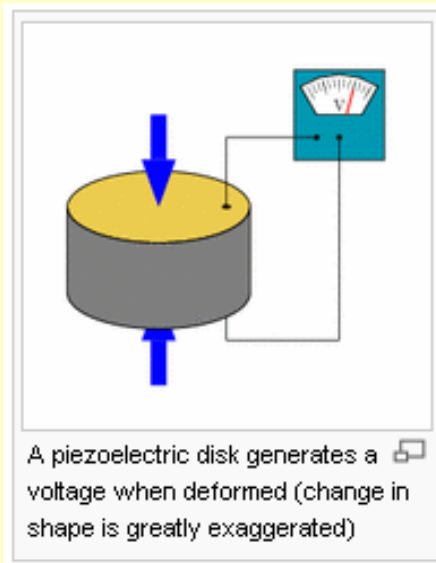


**Panametrics (GE Sensing) Flare Gas Flowmeters**  
**Flare Gas Measurement Standard for Refineries, Since 1982**



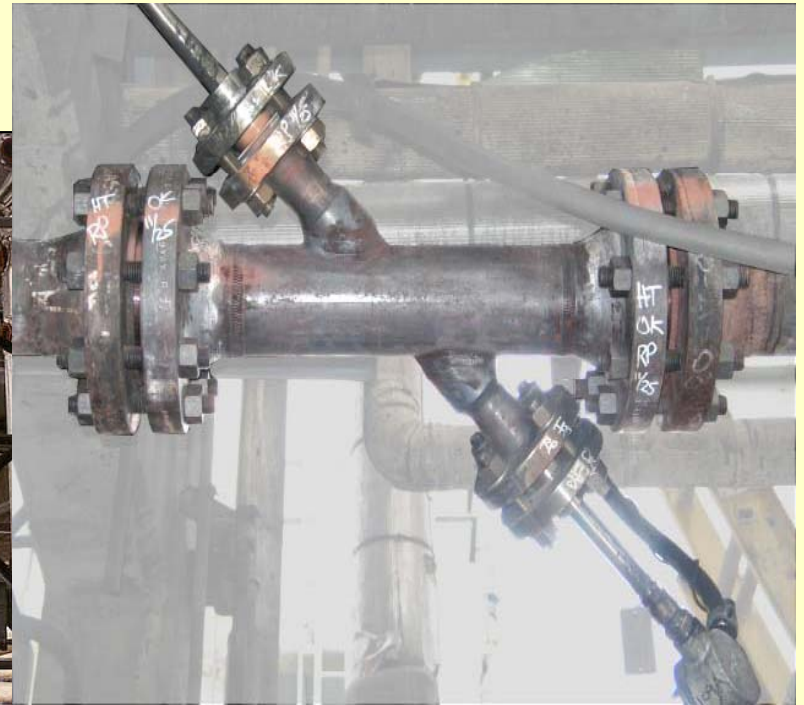
# Ultrasonic Flow Measurement Technology

- Alternate “Transit Time” Measurements (Upstream & Down)
- Measured Delta T is Proportional to Velocity (Linear)
- High Turndown
- Zero Pressure Drop



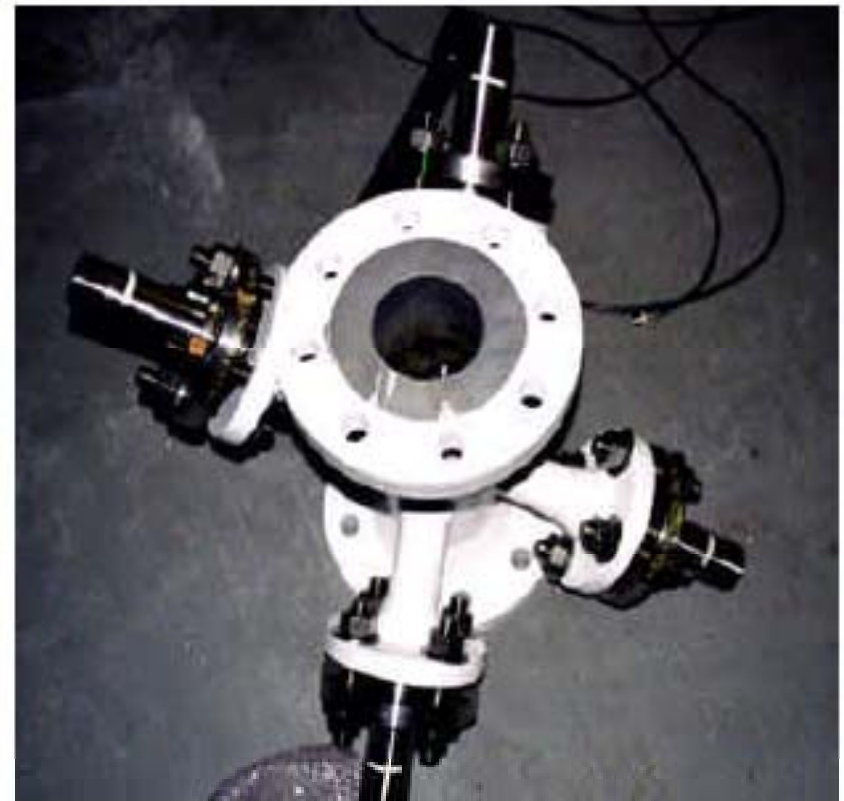
# **Bundled Waveguide Technology**

- Superior Reliability for Coker Feed Flow Measurements
- Repeatability:  $\pm 0.5\%$  of Reading
- Accuracy:  $\pm 1\%$  of Reading
- No Obstruction to Flow
- No Pressure Drop
- No Recalibration Required...Ever



# **Bundled Waveguide Technology**

- Retractable Sensors under Flowing Conditions
- No Impulse Lines to Maintain
- 80% Reduction in Maintenance Man Hours Required
- Can Match Existing Wedge Element Face-to-Face Dimension





# “Bundled Waveguide Technology”

Superior Performance for Coker Feed/Heavy Resid



# More **RELIABLE** Feed Flow Measurements

## Bundled Waveguide Technology

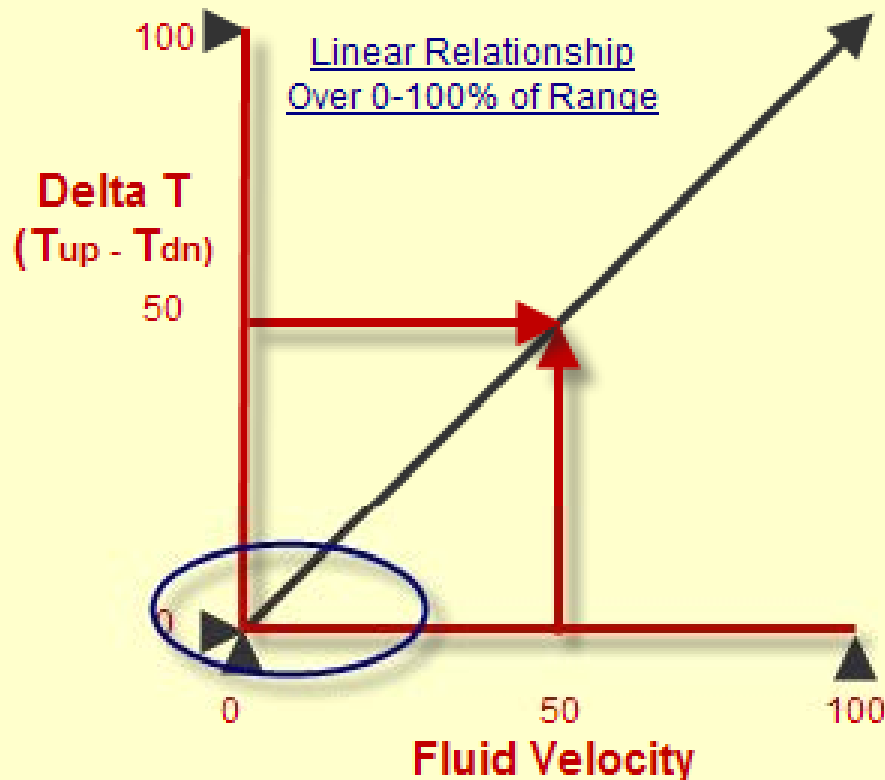
- Provides Totally Dependable Feed Flow Rate Information
- Reduced Risk of Fire, Personal Injury or Equipment Damage
- Significantly reduces the Risk of Furnace Trips  
(due to Feed Meter Unreliability)



# More **RELIABLE** Feed Flow Measurements

## **Bundled Waveguide Technology**

- Superior Low-End Accuracy & Reliability, during Startup
- Significantly Safer Unit Operation
- Reduced Risk of Fire, Personal Injury & Equipment Damage

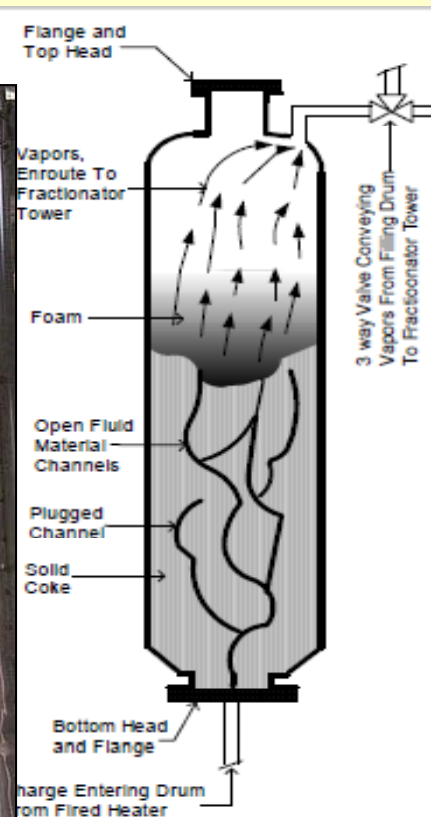
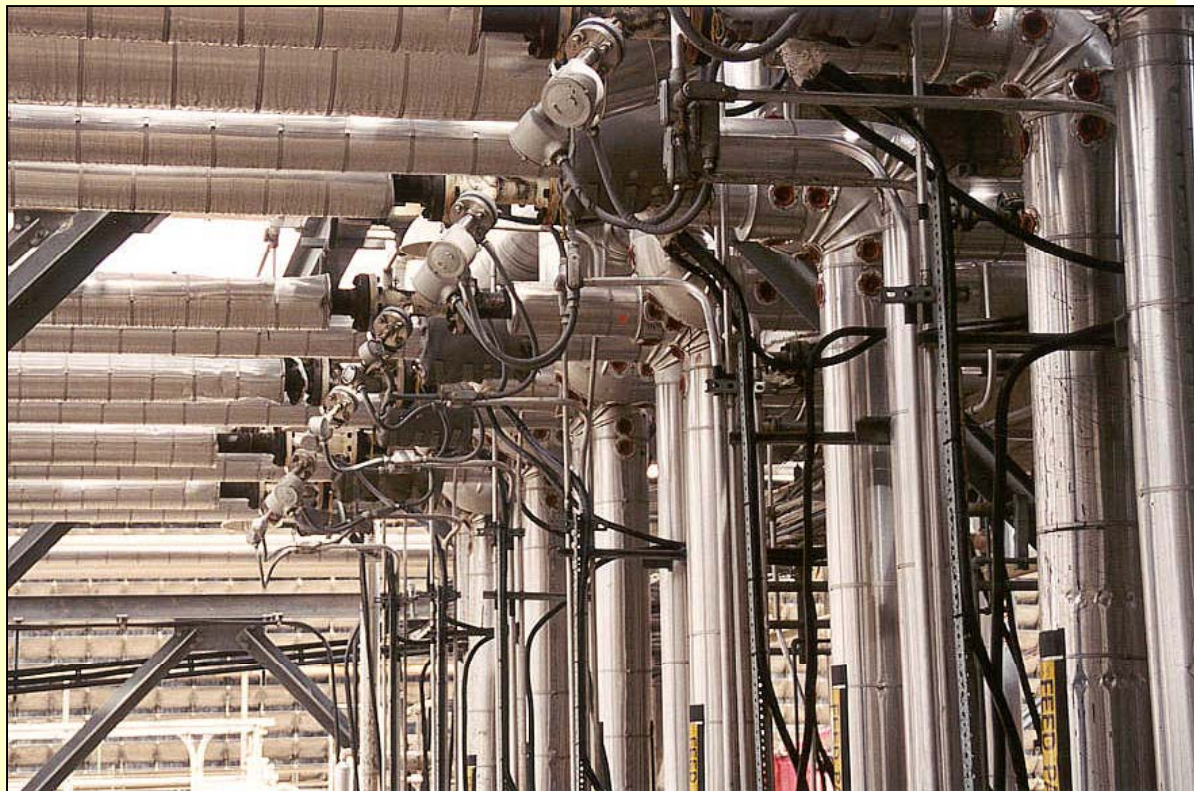




# More **ACCURATE** Feed Flow Measurements

## Bundled Waveguide Technology

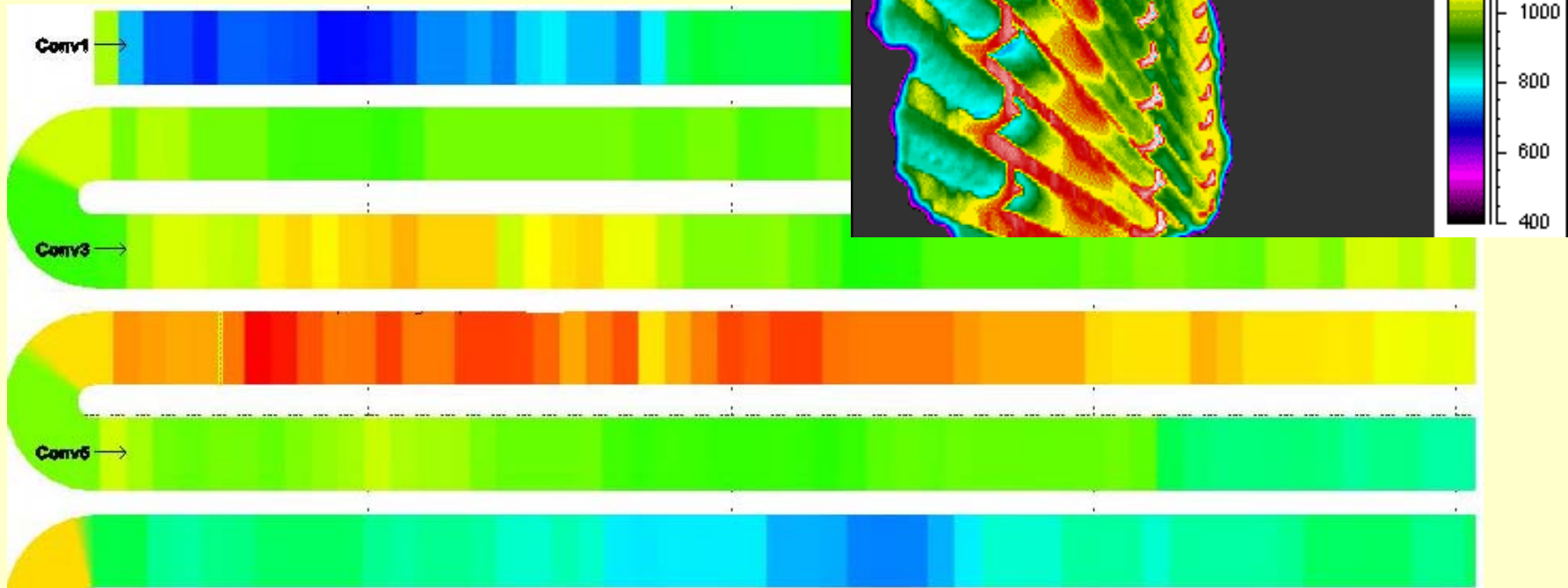
- Optimizes Furnace Load Balancing & Zone Flooding Control
- Provides for more Accurate Control of Drum Fill Times
- Increases Batch Efficiency & Unit Productivity



# More **ACCURATE** Feed Flow Measurements

## Bundled Waveguide Technology

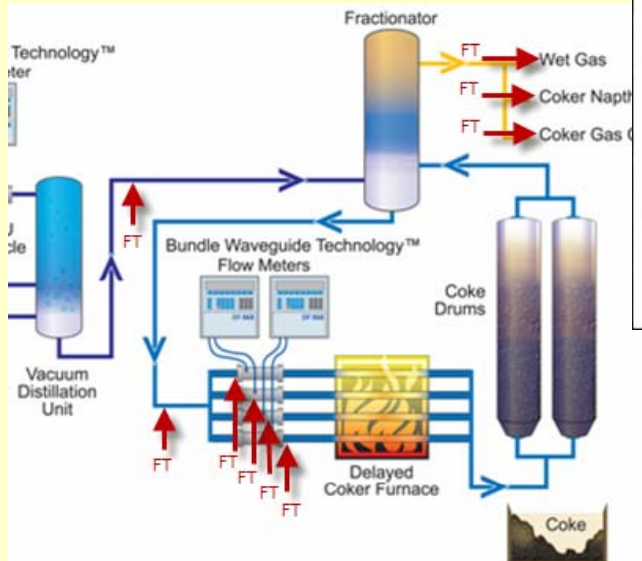
- Provides for more Efficient Application of Velocity Steam
- Reduces Tube Fouling Rates
- Increases Heater Run Lengths
- Increases Productivity



# More **ACCURATE** Feed Flow Measurements

## Bundled Waveguide Technology

- Significantly Improves Mass Balance Accuracy
- Provides for More Accurate Recycle Rate Calculations
- Enables the Accurate Measurement of Unit Performance
- Helps Improve Unit Efficiency & Productivity



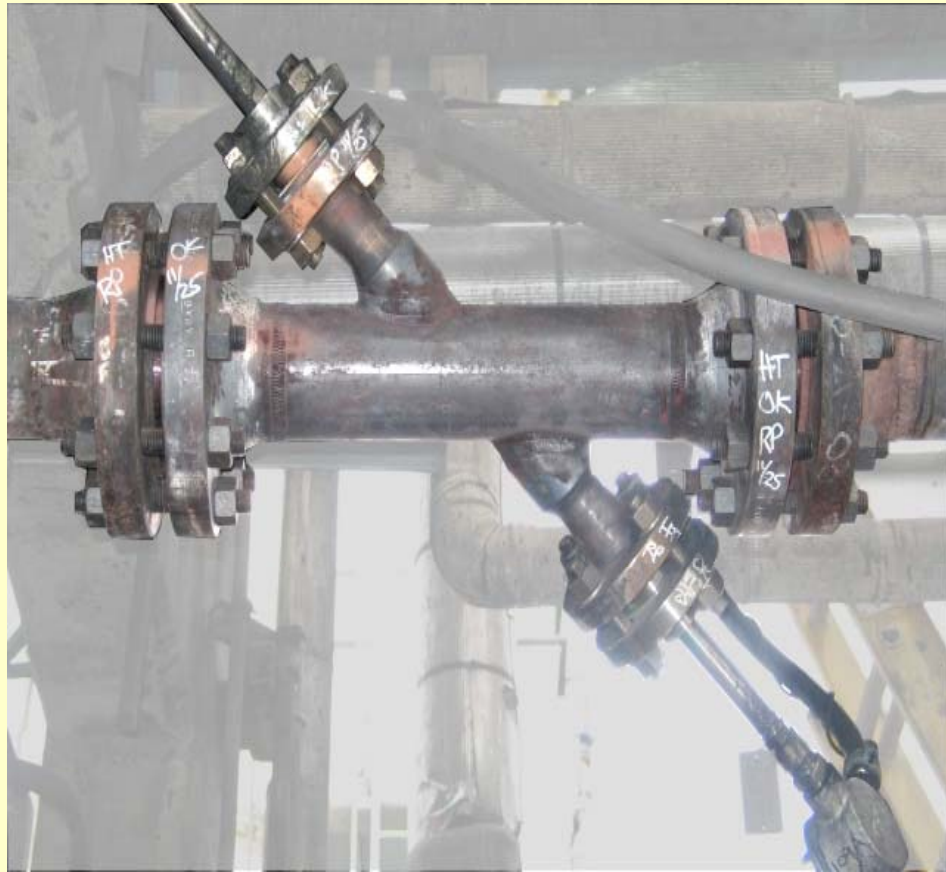
Sample N°	Density (kg/m <sup>3</sup> )	Yield %	Sample N°	Density (kg/m <sup>3</sup> )	Yield (%)
1(*)	410.5	52.4	16	486.0	57.1
2	414.0	51.1	17	488.0	53.4
3	417.0	52.6	18	490.0	54.8
4	419.5	54.6	19	492.0	55.9
5	425.5	57.2	20	494.0	52.4
6	427.5	52.1	21	528.0	56.4
7	430.5	51.2	22	505.5	56.6
8	433.0	54.6	23	532.5	53.1
9	438.0	56.0	24	536.5	56.0
10	447.5	56.0	25	541.5	57.4
11	476.0	55.7	26	543.5	57.8
12	478.0	55.6	27	546.5	52.7
13	451.0	53.9	28	557.5	56.6
14	482.0	55.60	29	572.5	54.8
15(*)	484.0	53.1	30(*)	584.0	52.7





# **Increase Delayed Coker Capacity** **Bundled Waveguide Technology**

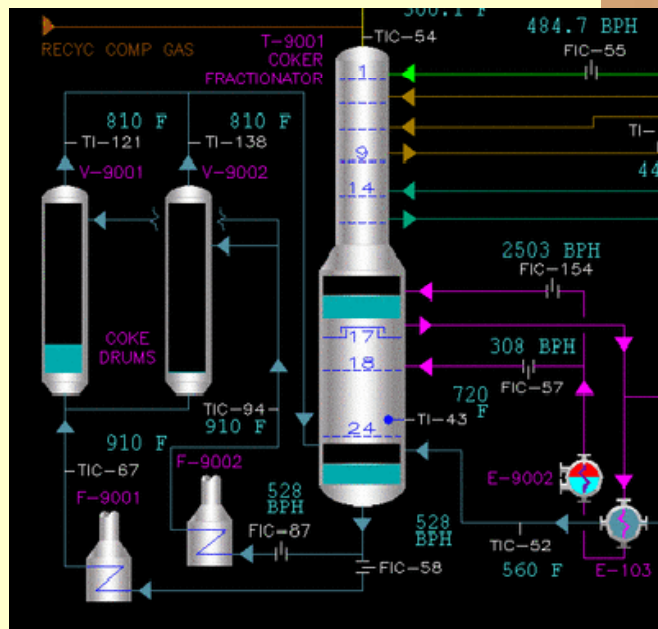
- Eliminates the Need for DP Impulse Lines & Purge Fluid
- Increases Unit Capacity
- Reduces HCGO Loss



# Increase Delayed Coker Productivity

## Bundled Waveguide Technology

- Reduces Tray Temperature Control Span  
(More Accurate Pump Around Flow Measurement Accuracy)
  - Improves Boiling Point/Density Control
  - Increases Yield
  - Reduces Recycle



# **Reduce Maintenance Man Hours** **Bundled Waveguide Technology**

- Reduces Man Hours in the Unit & Risk of Injury
- Reduces Maintenance Man Hours Cost





# Calculating Cost of Ownership

## Bundled Waveguide Technology vs Differential Pressure

### Delayed Coker Furnace Feed Flowmeter Applications

#### Flowmeter "Cost of Ownership" Evaluation Tool Bundled Waveguide Technology vs Wedgemeters/Orifice Plates/DP

Jon Clog  
Oil & Gas Flow Applications  
+1 (832) 248-3247  
jon.clog@ge.com

BWT 1 Yr Benefit	\$	1,113,363
BWT 3 Yr Benefit	\$	3,340,089
BWT IRR		2420%
Payback Period (Yrs)		0.12

#### Issue & Associated Impact on Profitability

##### Common Information

	Traditional Solution	BWT	Notes
Pass lines per Furnace	4	4	This section focuses on defining general information, regarding the furnace of interest. These values are used for calculations in other sections.
Feed Flow Measurements (Control + Shutdown) per Pass Line	2	2	
Number of Flow Measurements per furnace	8	8	
Taps per Pass Line (For injected purge liquid to maintain DP impulse lines)	4	-	
Taps per Furnace	16	-	
Cost per Man Hour (Maintenance)	\$ 22.00	\$ 22.00	

##### Capitol Cost of Flow Measurement Components/Application

<b>Capital equipment costs for one measurement</b>	\$ 12,464	\$ 18,964	Determine Capitol Cost for a single point of measurement, considering all costs associated with the meter type.
Consider all components including valves, impulse lines, taps Include cost of one meter installation.			
<b>Total capital equipment and installation costs</b>	\$ 99,712	\$ 151,712	

##### Profit Loss, Due to Injected Purge Fluid to Maintain DP Impulse Lines

Purge Liquid Volume Injected per Tap (BBL/Day)	10	-	Some designs use a purge liquid to prevent blockage of DP impulse lines. This is done by injecting gas oil, high pressure steam or boiler feed water into the pass lines. Lost production capacity, due to purge fluid injection, can be significant. BWT's do not require impulse lines.
Purge Liquid Volume Injected per Furnace (BBL/Day)	160	-	
Profit per processed BBL of Feed	\$ 21.50	\$ 21.50	
Daily lost profit per furnace	\$ 3,440	\$ -	
<b>Annual lost profit</b>	\$ 1,255,600	\$ -	

##### Cost of Furnace Trip or Unplanned Shutdown

Unit Capacity (bbl/day)	23,000	23,000	
Profit per Barrel	\$ 40.00	\$ 40.00	

# Contact Information

## **Milton Cabral**

GE Sensing  
Latin America Sales Manager  
Rua Alexandre Marcondes Filho 115 Vila  
Sao Bernardo do Campo  
SP 09726330 BR  
Cell# 55-21-7832-8779  
Office# 55-21-3824-0691  
E-mail Address: [milton.cabral@ge.com](mailto:milton.cabral@ge.com)

## **Michael Franco**

GE Sensing  
Latin America Sales Leader  
Billerica, Massachusetts USA  
Telephone: Cell# +1-508-572-7256  
Office# +1-978-437-1250  
E-mail Address: [michael.franco@ge.com](mailto:michael.franco@ge.com)

## **Jon Cloy/Presenter**

GE Sensing  
Houston, TX  
Cell# 001 832 248 3247  
E-mail Address: [jon.cloy@ge.com](mailto:jon.cloy@ge.com)

# Questions & Answers

