

The logo for Mangan Inc. is located in the top right corner. It consists of the word "MANGAN" in a large, white, sans-serif font, with "INC." in a smaller font directly below it. The text is enclosed within a white rounded rectangular border. The background of the logo is a blue shape that overlaps the top right corner of the image.

MANGAN  
INC.

The background of the entire page is a photograph of an industrial facility at night. The scene is illuminated by various lights, creating a warm glow against the dark sky. In the foreground, there are several large, cylindrical storage tanks with corrugated metal siding. Behind them, a complex network of pipes, ladders, and structural steel is visible. Several tall, vertical distillation columns or towers rise into the sky, some with multiple levels of platforms and ladders. The overall atmosphere is one of a busy, active industrial site.

**ANALYZER / CEMS  
ENGINEERING  
& TECHNICAL EXPERTISE**



# TECHNICAL EXPERTISE

## ANALYZER / CEMS ENGINEERING



### SERVICES

#### Turnkey analyzer engineering:

Integration and installation support - start to finish -  
Over 100 Continuous Emissions Monitors (CEMS)  
NOx/SOx projects completed since 1992

#### Analyzer Engineering

- Functional Specifications
- Analyzer selection/recommendations
- Sample conditioning systems design
- Control system design (PLC, DCS, PI/Historian)
- Shelter design
- Integration

### PROCESS ANALYZERS

#### Process Analyzer Capabilities:

- Monitor product quality or foreign component levels for process optimization
- Complete sample systems from probe to grade
- Control systems for system automation and testing
- Complete system infrastructure including personnel safety systems
- Data acquisition and interface with plant DCS for control, historization and reporting

#### Process Analyzer Challenges Include:

- Each process presents its own unique sample environment requiring particular attention to conditioning requirements and measurement technology selection



### ENVIRONMENTAL ANALYZERS

#### Continues Emission Monitoring Systems (CEMS):

- Monitoring stack emissions including NOx, SO2, O2, CO, stack flow and opacity
- Complete sample systems from sample probe at furnace stack to CEMS shelter at grade
- Control systems for system automation and testing
- Complete system infrastructure including personnel safety systems
- Data acquisition for historization and reporting
- Mangan has fielded a maintenance group for 25 years giving us special insight into end user's needs

#### CEMS Analyzer Challenges Include:

- Low level SO2 measurement and NO2 measurement (water soluble)
- High particulate environments
- High NH3 environments
- NOx reduction systems including upstream and downstream measurement systems

### FLARE ANALYZERS

#### Flare Analyzers Capabilities:

- Monitor speciated sulfur compounds and individual components contributing to the HHV content of the sampled gases
- Complete sample systems from probe to grade
- Control systems for system automation and testing
- Complete system infrastructure including personnel safety systems
- Data acquisition for historization and reporting

#### Flare Analyzers Challenges Include:

- Flare environments provide special challenges owing to the extreme variability of the gas content (or liquid!)
- Sample conditioning is extremely difficult yet critical if these systems are to perform
- Rule 1118 requires measurements of sulfur from 20 ppm to 25%. This requires multiple range systems with saturation protection
- Mandated uptime requirements demand that these systems be robust

## ANALYZER TECHNOLOGIES

### Measurement Technologies:

- Chemiluminescence
- Gas-filter correlation
- Dual wave length infrared
- Ultraviolet fluorescence
- Paramagnetic
- Zirconium oxide
- Electrochemical
- Pitot tube  $\Delta P$
- Thermal dispersion
- Optical Scintillation
- Gas Chromatography
- Mass Spectrometry
- Calorimetry
- Pulsed Ultraviolet Fluorescence
- Lead acetate

## COMMISSIONING

### Commissioning Considerations:

- New CEMS: FAT (at integrator's facility) and SAT
- Detailed Commissioning Procedure
- Pre-requisites - FAT and SAT completed; MOC and PSSR requirements, training, operator orientation
- Install probe & tube bundle during commissioning
- Covers physical equipment cutover and procedural issues - confirmation of DCS/data functions, alarms, second shift coverage etc.
- Multi-discipline Commissioning Team: Operations, CEMS Maintenance, Environmental, Control Systems, Mangan.
- Generally achieved in eight (8) hours

## FOUNDATION & CABLE TRAY RACKS FOR ANALYZER SHELTERS



## CIVIL & STRUCTURAL

### Foundation Design

- Obtain geotechnical report with cost efficient recommendations.
- Foundation design and analysis in accordance with all applicable building codes.

### Structural Steel Design

- Steel design and analysis, with expertise in connection detailing for seismic applications.
- Assist with competitive bid for steel fabrication and review of shop drawings.

### Miscellaneous

- Plan Check & Permit - Submit plans and coordinate with building official to obtain Ready to Issue permits.
- Equipment Drawings and calculations - Review vendor documents to ensure compliance with project needs and client standards.

## PIPING MODIFICATIONS FOR ANALYZER SHELTERS

## SCOPE OF WORK:

### Analyzer shelters:

#### Sample Probe

- Hot tap on Flare line for sample probe to provide flare gas to analyzer
- Isometrics for sample line
- BOM for piping, hand valves, flanges, etc.

### Utility

- Piping design for various utility connections to Analyzer shelter
- Instrument air
- Steam
- Water