

PETROTAG TECHNOLOGIES

Serving the Petroleum Industry for
20 years

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PetroTag

**Accurate Centralized Monitoring
of the
Entire Petroleum Supply Chain**

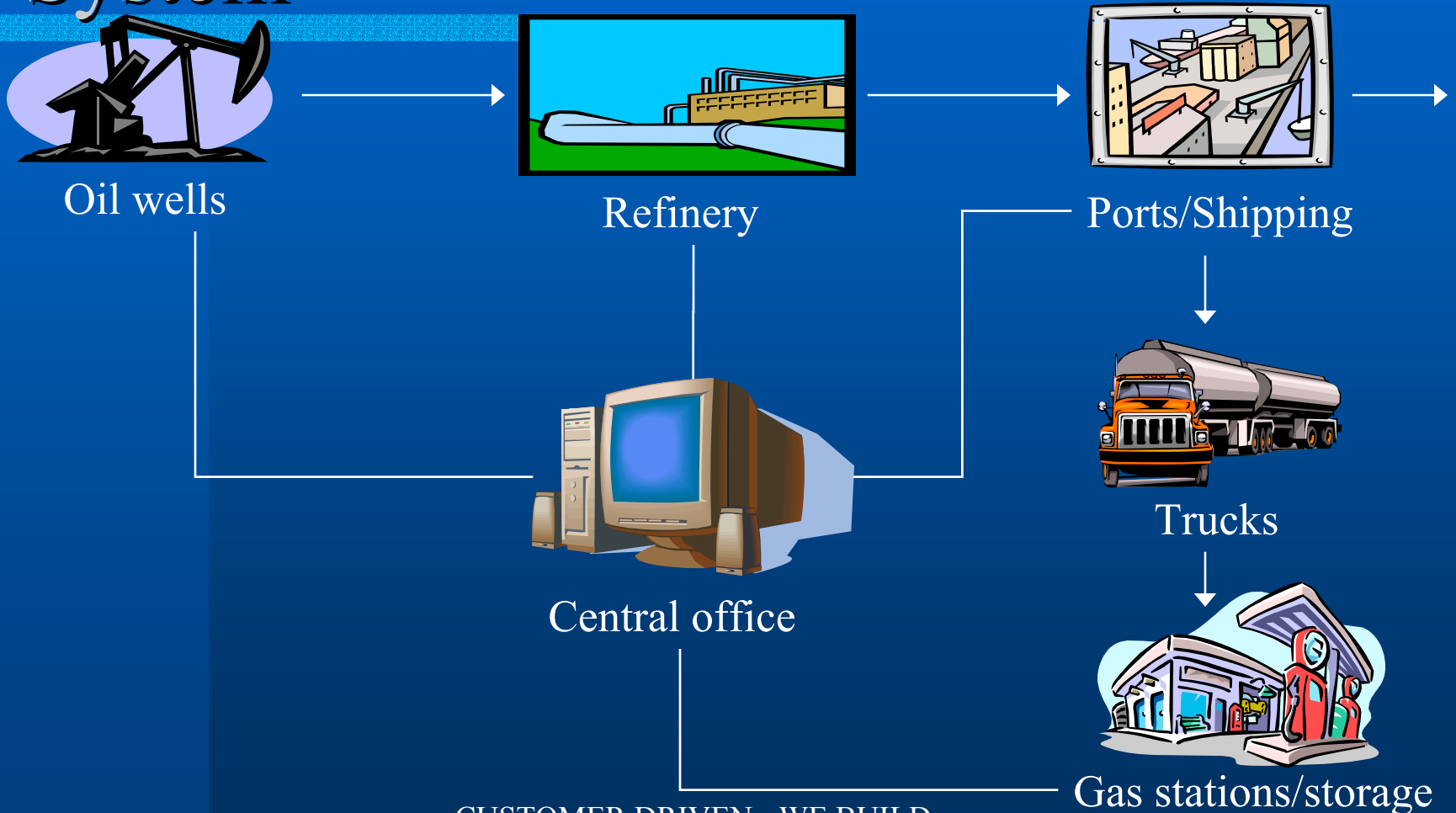
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Introduction & Overview

- **Presentation Overview**
 - **Centralized Monitoring**
 - **Fundamental Technology behind the PetroTag System**
 - **Current PetroTag System**
 - **Manufacturing**
 - **Installation & Service**
 - **Engineering**
 - **General Discussion/Question Period**

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Centralized Monitoring of the Entire System



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Centralized Monitoring of the Entire System

- **Centralized Control**
 - optimize inventory and transfer
 - improve efficiency
 - eliminate costly mistakes
 - every event is logged
- **Centralized Monitoring of Equipment**
 - find problems early
 - remote diagnostics
 - instruct local repair crew

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Centralized Monitoring of the Entire System

- **Eliminate Human Error**
 - errors in paperwork
 - errors in product transfer
 - theft
- **Timely Reporting**
 - see the entire system at a glance - instantly
 - respond to changing needs and circumstances
 - correct errors before they compound

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Local Monitoring and Control

- **Transfer Monitoring**

- Every transfer is monitored and logged
- Type of product is monitored and logged

- **High Level Alarms**

- Automatic shutoff avoids spills
 - Loss of product
 - Cost of cleanup

Accurate Monitoring

- **Inherently Accurate**
 - Single transducer
 - self calibration
 - good value
 - Simple probe
 - easily maintained
- **Temperature Compensated Measurements**
 - Avoids confusion and errors

Accurate Monitoring

- **Water Level Measurement**
 - Gives actual product quantity
 - Detects poor product quality
 - Detects deliberate falsification

- **Density Measurement**
 - Identifies product type
 - Avoids incorrect product transfer
 - Detects deliberate falsification

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PetroTag - The Best Product

- **Centralized Monitoring**
 - timely control of the whole system
 - avoid human errors
- **Proven**
 - thousands of tanks installed
- **Reliable**
- **Accurate**
- **Good Value**

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Fundamental Technologies

- Introduction to the system design
- Performance of the PetroTag System
- Tank Gauging Technologies
- Theory behind PetroTag
- Overview of the PetroTag System

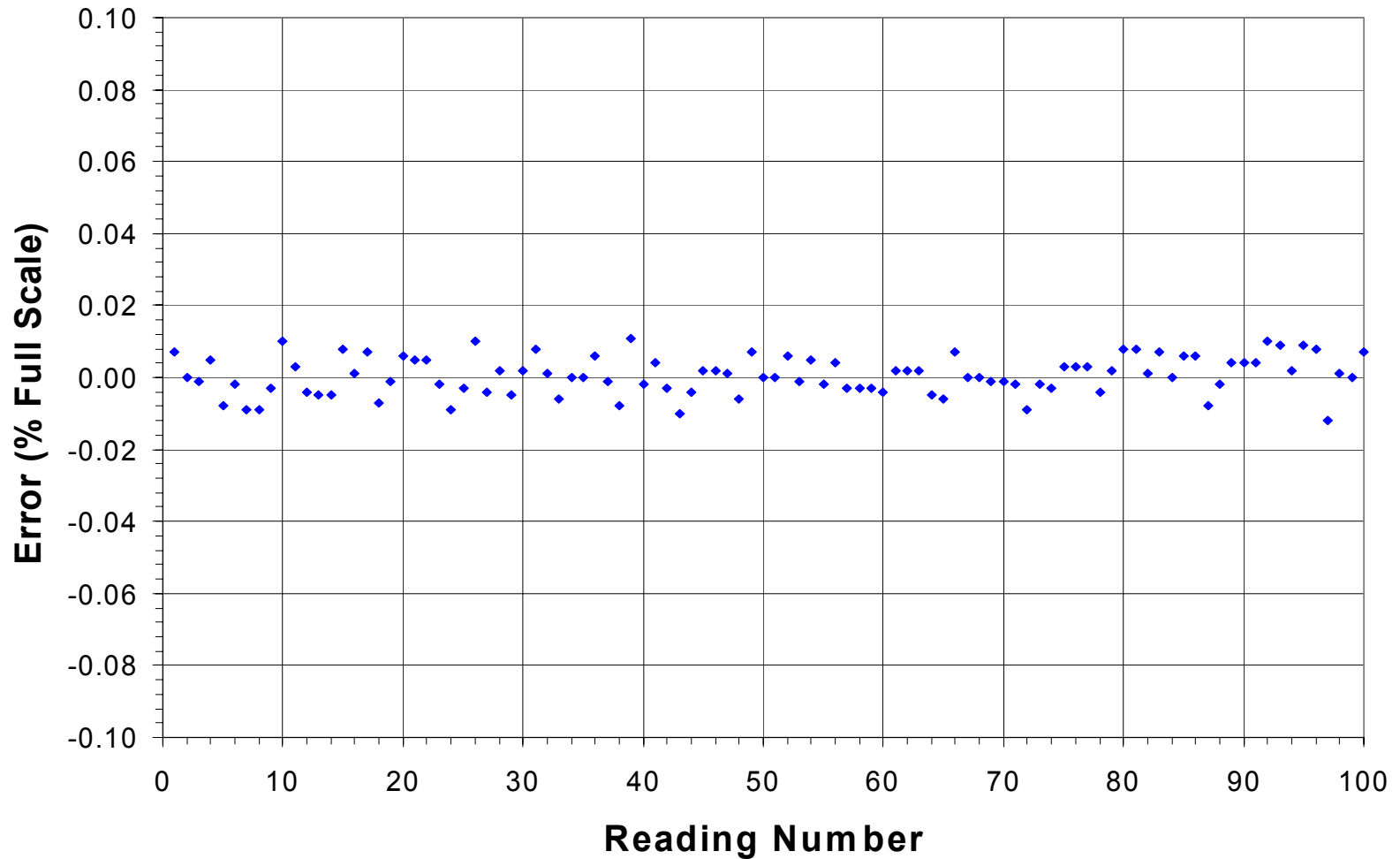
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Introduction to PetroTag Design

- **Three Main Themes**
 - **Simplicity**
 - **Inherent Accuracy**
 - **Insensitivity to Temperature of Product**

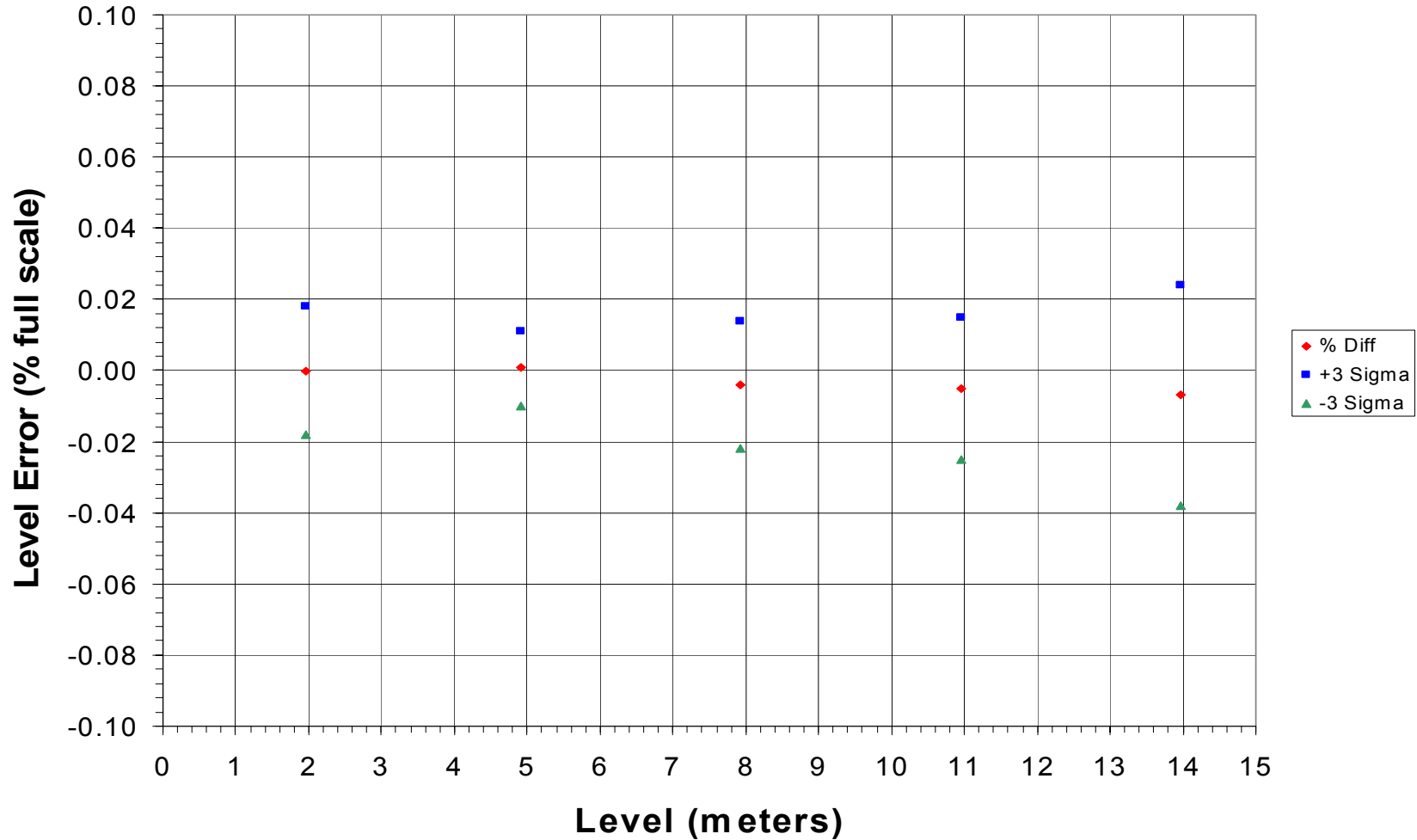
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Performance of PetroTag System (Error at 5 meter height)



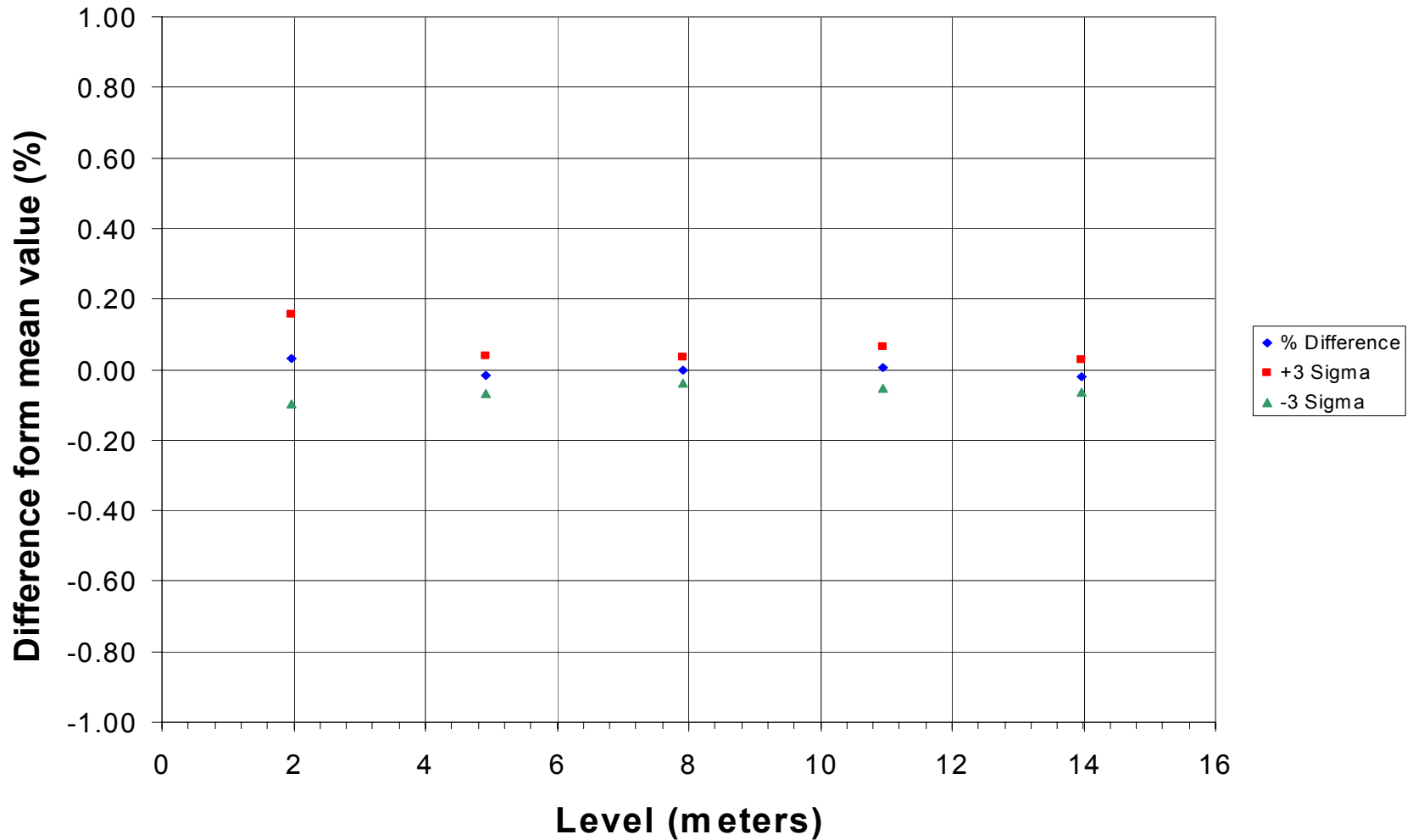
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Performance of PetroTag System (Level Measurement)



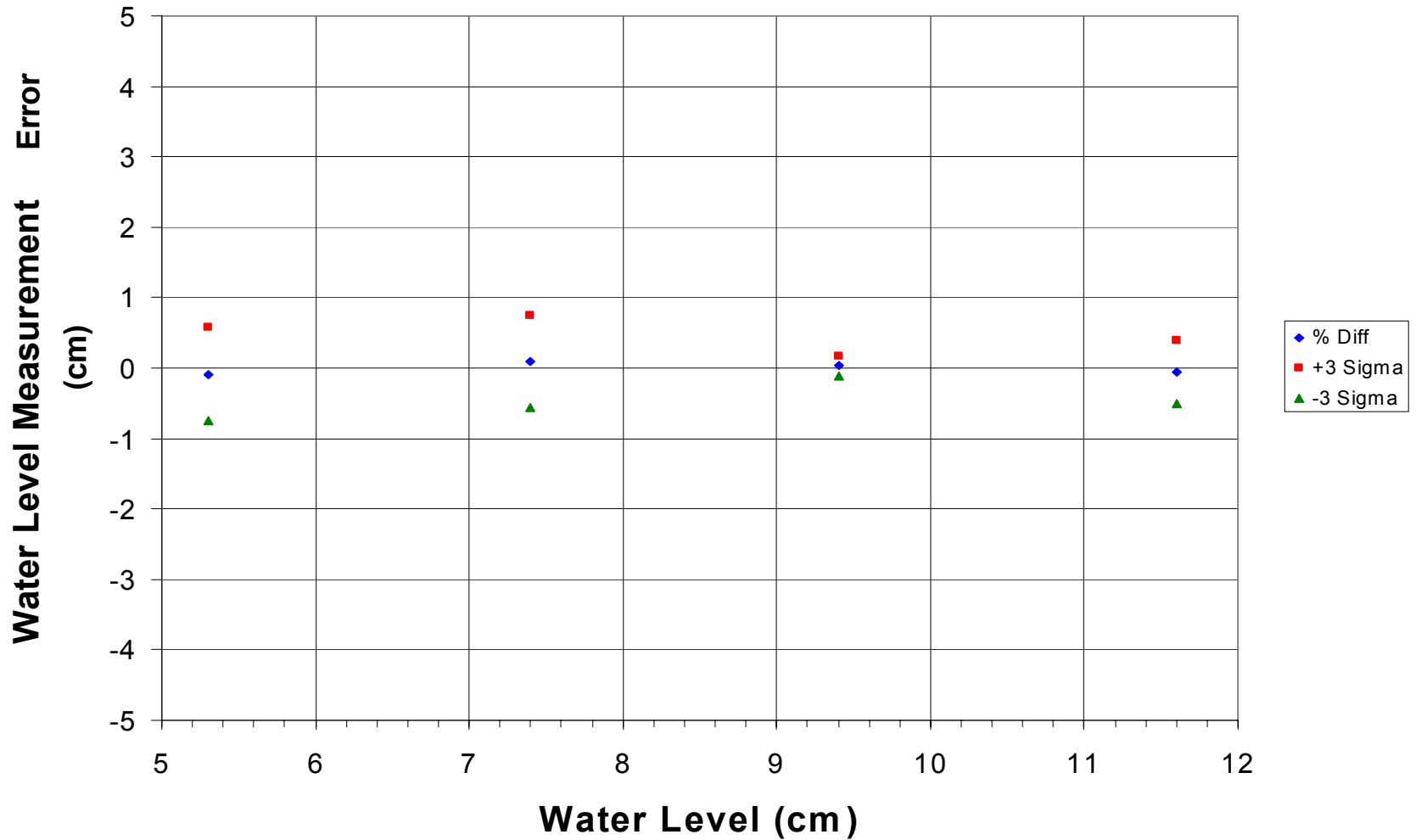
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Performance of PetroTag System (Density)



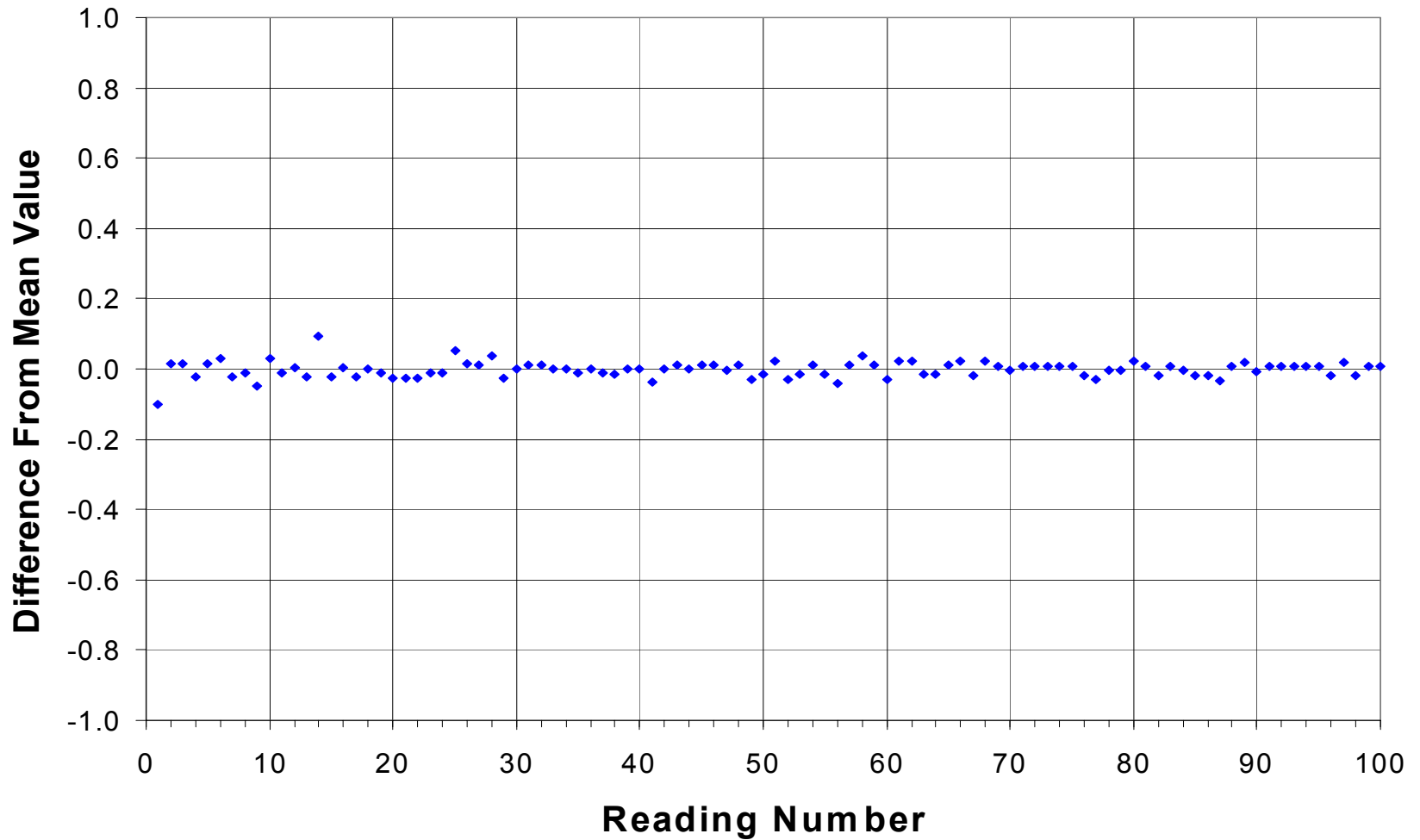
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Performance of PetroTag System (Water Level)



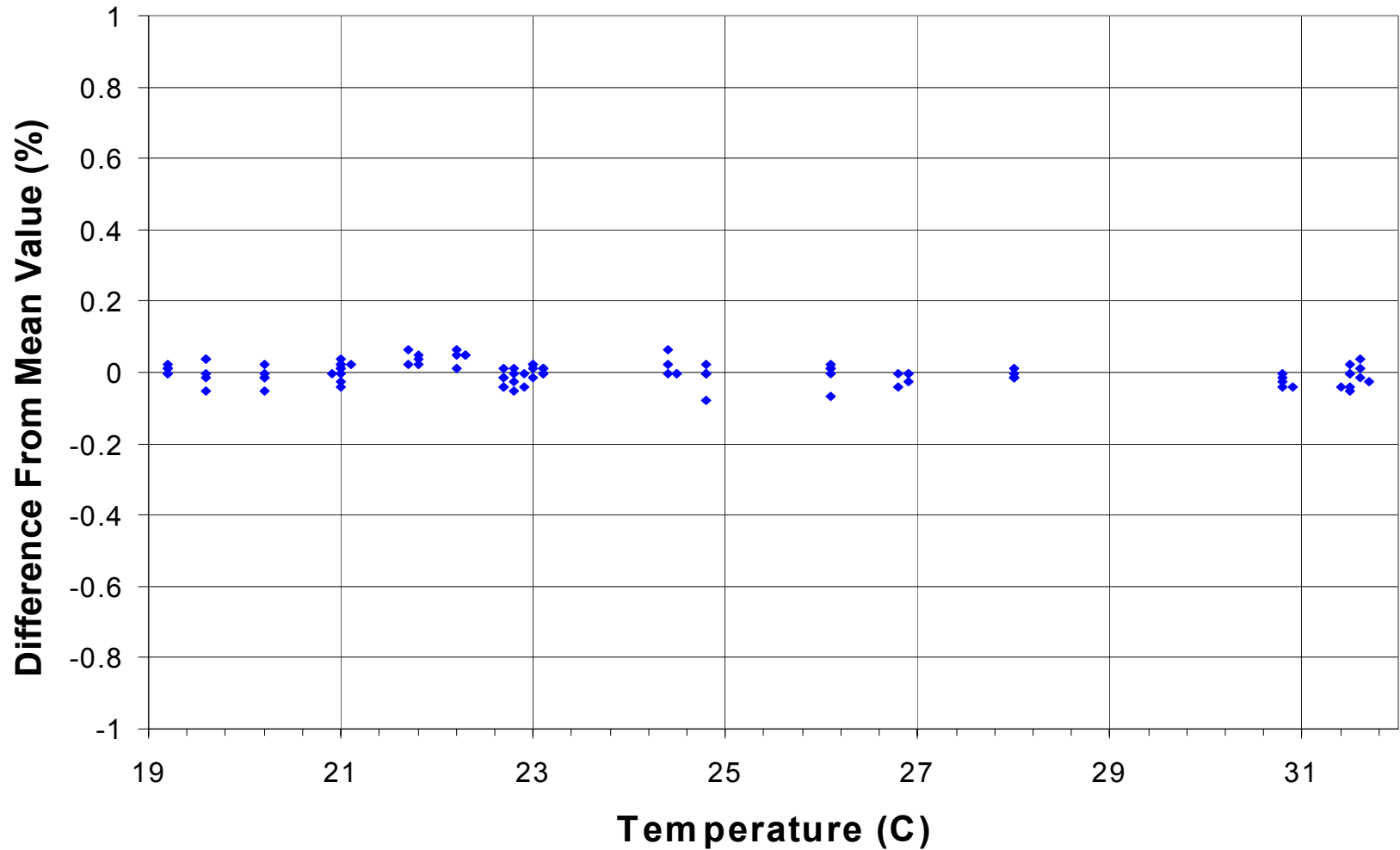
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Performance of PetroTag System (Density at 14 meters)



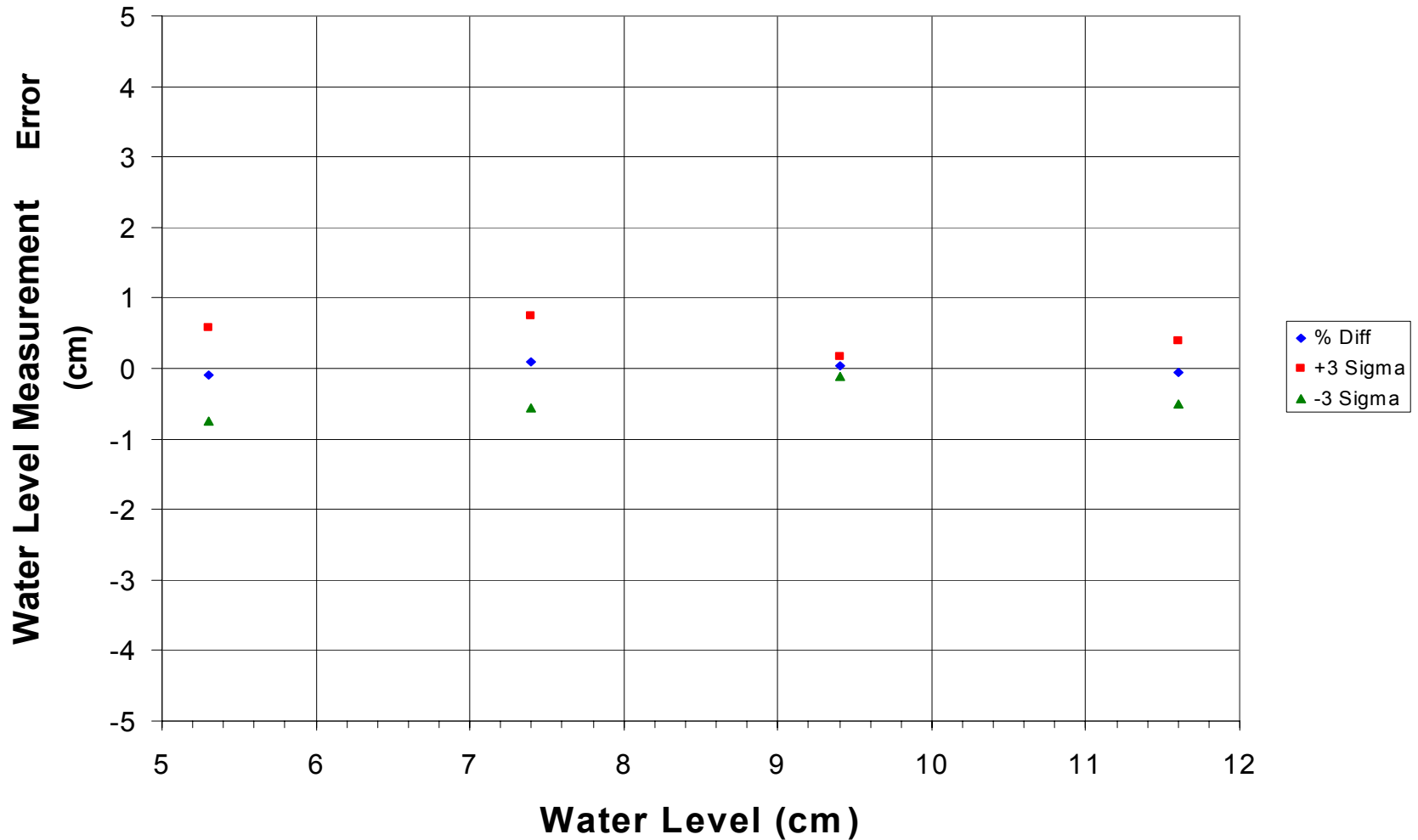
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Performance of PetroTag System (Density Vs. Temperature)



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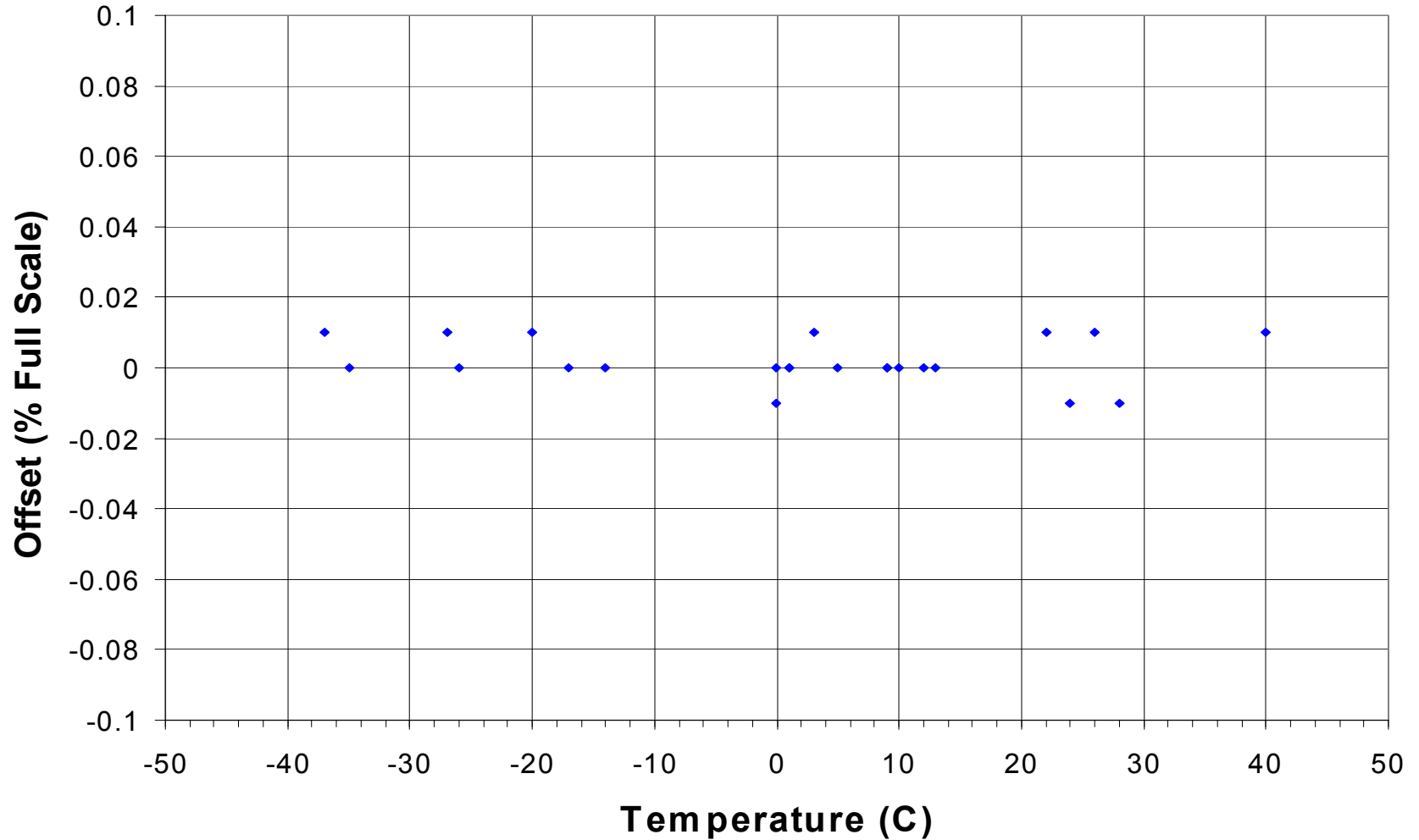
Performance of PetroTag System (Water Level)



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Performance of PetroTag System

(Offset Vs. Temperature and Time over 10 months)



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Tank Gauging Systems

- **Float**
- **DP Cell**
- **Bubbler***
- **Capacitance**
- **Ultrasonic**
- **Radar**
- **Hydrostatic***
- **PETRO TAG**

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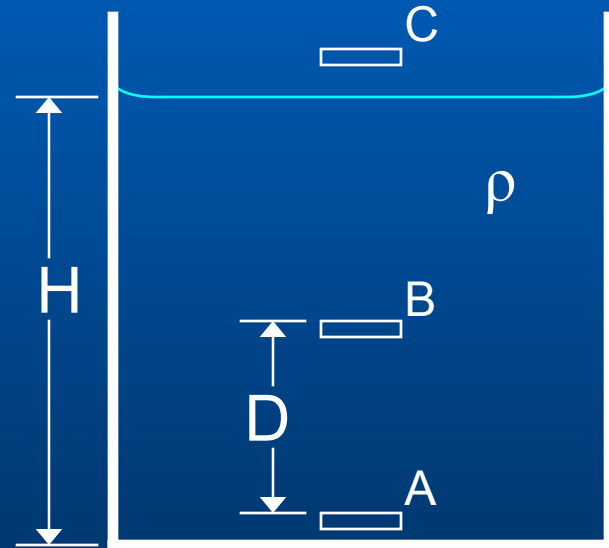
Hydrostatic Tank Gauging

$$1.) P_A = \rho(t)gH + P_c$$

$$2.) P_B = \rho(t)g(H - D) + P_c$$

$$3.) H = \frac{\rho(t)g(P_A - P_c)}{\rho(t)g(P_A - P_B)} \times D$$

$$4.) H = \frac{P_A - P_c}{P_A - P_B} \times D$$



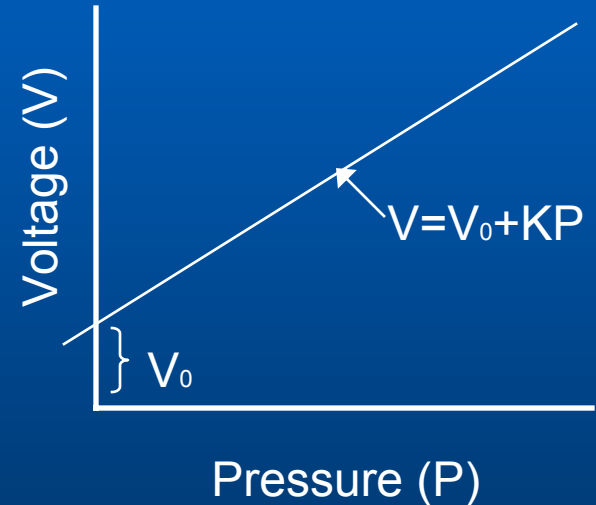
Hydrostatic Tank Gauging

$$4.) H = \frac{P_A - P_c}{P_A - P_B} \times D$$

$$5.) P = \frac{V - V_0}{K}$$

$$6.) H = \frac{\frac{V_A - V_{0A}}{K_A} - \frac{V_C - V_{0C}}{K_C}}{\frac{V_B - V_{0B}}{K_B}} \times D$$

Transducer Characteristics



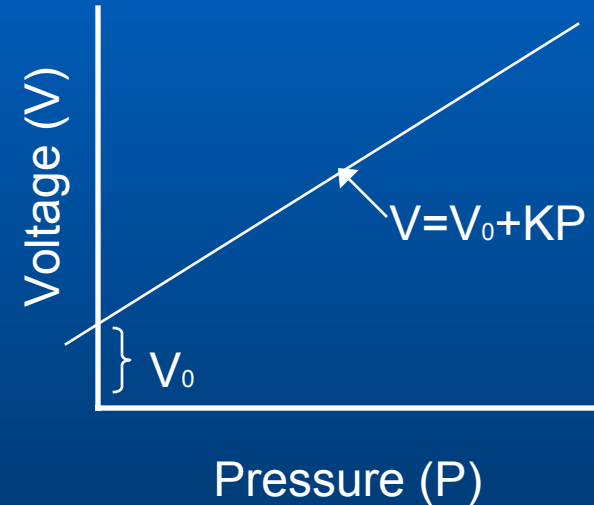
Hydrostatic Tank Gauging

$$6.) H = \frac{\frac{V_A - V_{0A}}{K_A} - \frac{V_C - V_{0C}}{K_C}}{\frac{V_A - V_{0A}}{K_A} - \frac{V_B - V_{0B}}{K_B}} \times D$$

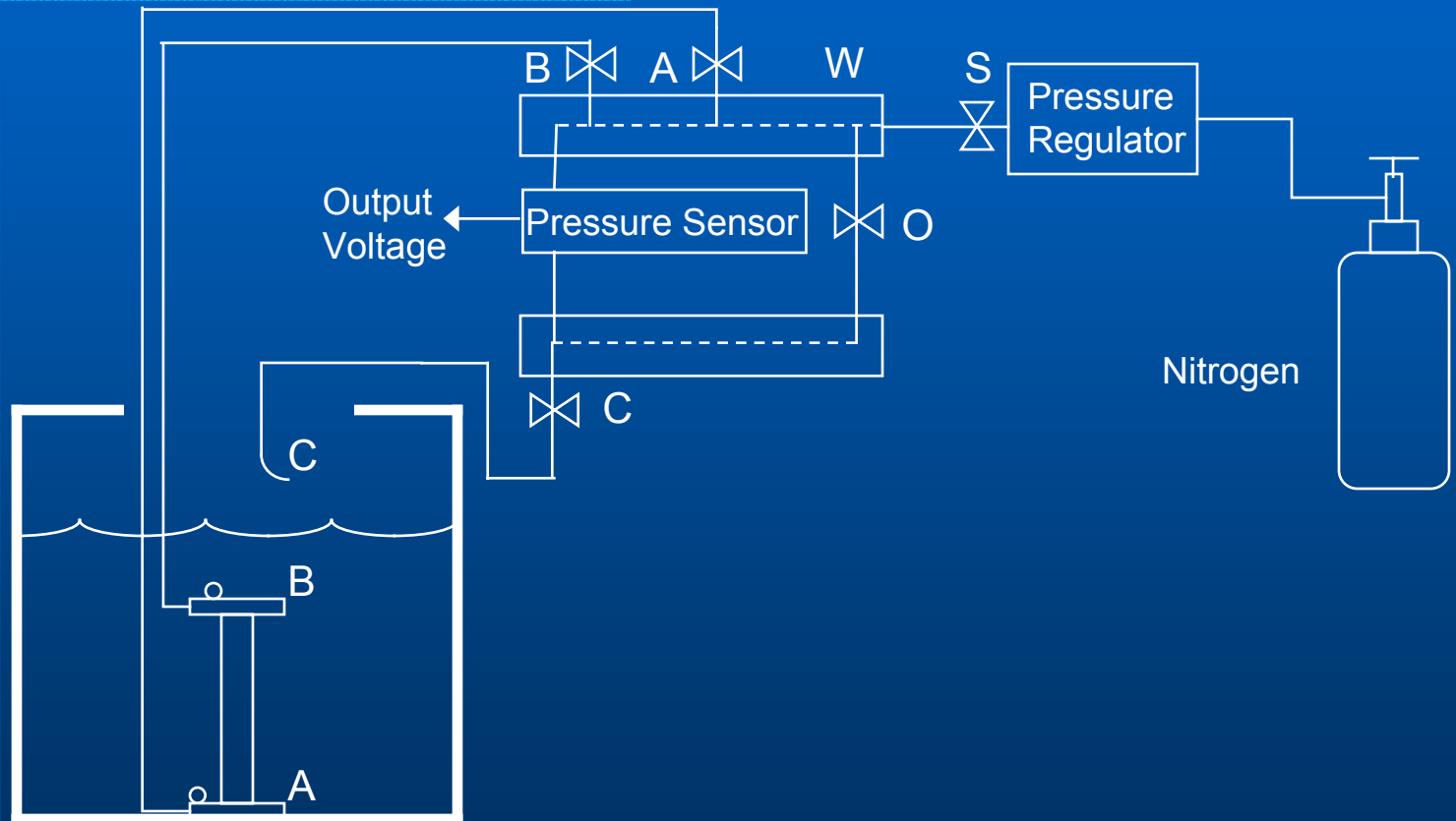
If $K_A = K_B = K_C$ and $V_{0A} = V_{0B} = V_{0C}$,

$$7.) H = \frac{V_A - V_C}{V_A - V_B} \times D$$

Transducer Characteristics

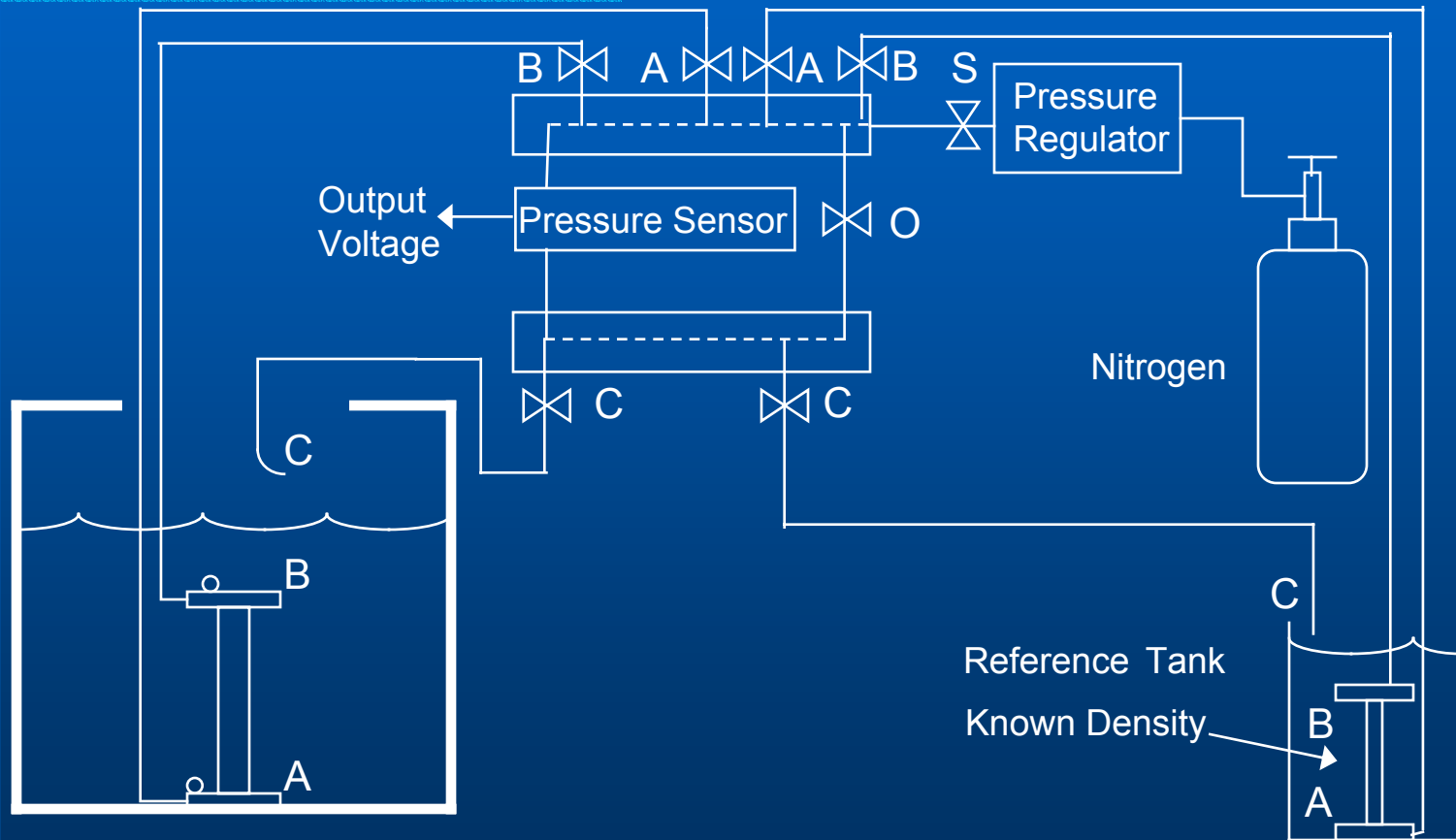


Basic PetroTag System



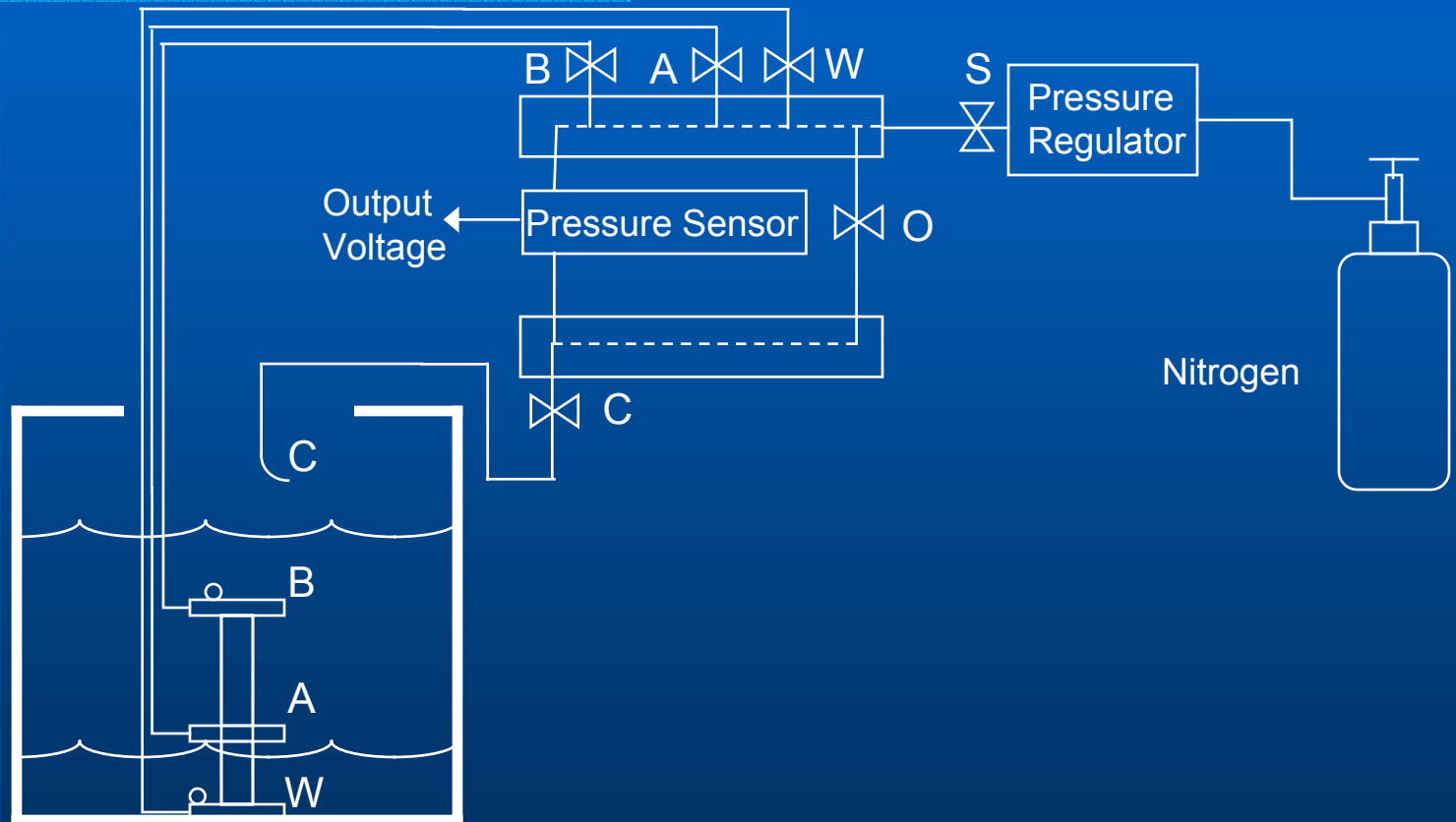
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PetroTag System (Density)



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PetroTag System (Water Plate)



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Current PetroTag Product

- **Features & Benefits**
- **Reading Types**
- **Interface types**
- **Alarms**
- **Event Recording**
- **Configurable Preferences**
- **Operating Conditions**
- **Accuracy**
- **System Components**

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Features and Benefits

- **Modified HTG**
- **No calibration required**
- **Single pressure transducer**
- **In service installation**

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Reading Types Supported

- **Mass**
- **Density**
- **Volume**
- **Height**
- **Temperature**
- **Temperature Corrected Volume**
- **Water Level Sensing**
- **Programmable Alarms**
- **Networking**

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Interface Types

- **Interior Display**

- Displays all relevant information for tanks being monitored
- Allows programmable, preset, unmanned measurements

- **Communications**

- Modem communications with central office
- Allows centralized inventory control and management
- Can reduce the cost of inventory and optimize deliveries

Interface Types

- **Exterior Display**

- Weather proof enclosures, mounted conveniently at the controller
- Allows filling or draining operator to monitor operations
- Displays height, volume, or ullage

- **Printer Kit**

- Provides hard-copy for all gauging activities
- Used for inventory records, delivery and sale conformation
- Used for recording unmanned off- hours measurements

Alarms

- **Tank Gauge with integral Alarms**
 - Cost effective combination
 - Simple to use
 - Familiar to tank and truck personnel
- **Overfill Alarm**
 - Secondary overfill prevention system
 - Redundant high level alarm
 - Uses simple, reliable mechanical switch
- **Fill Monitoring**
 - Dual alarm levels
 - Caution and Danger
 - Over fill prevention system
 - Uses proven pneumatic system
- **Alarm Acknowledgment Configurable**
 - Time-out acknowledgment
 - Acknowledgment at Interior & Exterior display

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Event Recording

- **All significant events are recorded including**
 - **Measurements at the start and end of fill monitor mode**
 - **All Alarms**
 - **Alarm Acknowledgments**

Configurable Preferences

Units of Measure

- **Metric units**
 - Meters, Liter, Celsius, Kilograms
- **Standard U.S. Units**
 - Feet, Inches, and Sixteenths
 - Feet, Inches, and Tenths
 - Barrels, Gallons, Fahrenheit, Pounds
- **Date Format**
 - Day/Month/Year, Month/Day/Year, Year/Month/Day

Operating Conditions

- Temperature range:** - 50 to + 70 °C
- Liquid Type :** Refined petroleum products
(consult factory for chemical compatibility)
- Tank Type :** Vertical and/or horizontal Tanks
- Maximum Tested Tank Height 15 Meters**

Accuracy

● Standard Precision

- Height $\pm 0.1\%$
- Volume $\pm 0.1\%$
- Mass $\pm 0.25\%$
- Density $\pm 0.25\%$
- Temperature $\pm 0.5\%$
- Water Level $\pm 1\text{cm}$

Extra Precision

- 0.02% of full scale
- 0.02% of full scale
- 0.02% of full scale
- 0.06% of full reading
- 0.2° Celsius
- 0.3 Centimeter

Manifolds

Manifolds:

Insulated and weatherproof enclosures

- **Protects pneumatics from the elements**
- **Allows outdoor installation close to tank site**
- **Convenient to use**
- **Attractive finish**

Common low pressure manifold

Low voltage solenoid valves

- **High Usage rating**
- **Low power consumption, high MTBF**
- **Unilets for strain relief and secondary fume containment**

Probes and Tubing

- **Solid Steel Probes**

- Very robust
- Very high MTBF
- Heavy
- Hang vertically for accurate readings
- Stable in swirling fluid
- Settle quickly after fill
- Small Diameter
- Short for easy installation

- **Tank Entry**

- Standard sizes for easy installations
- Fume containment baffle for safety

- **Steel Probe Chain**

- Strong
- Stable
- Durable
- Low C.O.E.
- Will not stretch or break
- Low maintenance
- High accuracy
- Flexible for easy installation

- **Nylon Tubing**

- No deterioration in fuels
- High MTBF

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Tubing and Conduit

- **Armored Casing**
 - Protects tubing and wires from crushing or cutting
- **Poly Tubes**
 - Pneumatics for measuring points
- **2 Twisted Pairs**
 - Communications with in-tank components (overfill switches and temp sensors)
 - Shielded & Armored for added protection

Main Controller Board

- **Insulated and Weather Proof Enclosure**
 - Protects electronics from the elements
 - Allows outdoor installation close to tank site
 - Convenient to use
 - Attractive finish
- **Electronics**
 - Microprocessor based system for reliability, extensive feature set and simplified upgrades
 - Transducer oven maintains constant operating environment
 - Pneumatic interface to nitrogen tank and manifold
 - Communications interface to consoles for control and management
 - Electrical power hard wired for safety and reliability

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Installation

- **Site Preparation**
- **Equipment Installation**
- **Configuration & Calibration**
- **Operator Training**

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Installation

- **Site Preparation**
 - **Controller board mounting**
 - **Nitrogen tank mounting**
 - **Tank entry**
 - **Cable Trenching**
 - **Power source**

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Installation

- **Equipment Installation**
 - Main controller board
 - Tank probes
 - Internal & external indicators
 - Alarms, communications cables, etc.

Installation

- **Configuration & Calibration**
 - Tank charts
 - Strapping tables
 - Programming of main controller board
- **Operator Training**

Manufacturing

- In-House Manufacturing
- Quality Assurance

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In-House Manufacturing

- **Final Assembly of PetroTag system**
 - Ensures all parts have been created to specifications
- **Testing of fully assembled systems**
 - Ensures that every system shipped is in working order and passes all tests as described in our testing manuals
- **Calibration of assembled systems**
 - Ensures proper calibration and functionality of the system

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Quality Assurance

- **All systems are fully calibrated and tested prior to shipment**
- **ISO-9000 Compliant**

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Engineering

- **Strong Design Capabilities**
- **Custom Designs**
- **Strong Development Team**

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PETROTAG TECHNOLOGIES

We build GREAT products

Hopefully at a profit

If necessary at a loss

But ALWAYS

We build GREAT products

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