

Lact Skids

A practical guide to lact skids, covering the reader intent, the relationship to lact skids, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



Main topic: Main Page
<https://www.level-meters.com/>

In the oil and gas industry, the Lease Automatic Custody Transfer (LACT) unit serves as the definitive point of transaction between a producer and a buyer. Often referred to as the "cash register" of the oilfield, lact skids are integrated systems designed to accurately measure the quantity and quality of crude oil or petroleum products as they are transferred from a production site to a pipeline, truck, or railcar.

Because these transactions involve significant financial value, the precision, reliability, and automation of the instrumentation on the skid are paramount. This guide explores the engineering principles, core components, and critical role of level and flow measurement technologies within these systems.

Understanding the Function and Importance of LACT Skids

The primary purpose of a LACT unit is to automate the custody transfer process while ensuring that the fluid meets specific quality standards. Manual measurement methods, such as tank gauging by hand, are prone to human error and safety risks. In contrast, lact skids provide continuous, real-time data that satisfies both regulatory requirements and contractual obligations between parties.

For a transfer to be valid, the system must perform three main functions:

1. **Measurement:** Precisely recording the volume or mass of the fluid.
2. **Quality Assurance:** Monitoring the Basic Sediment and Water (BS&W) content to ensure the oil is "merchantable."
3. **Documentation:** Generating a record (meter ticket) that serves as the legal basis for payment.

Core Components of a Lease Automatic Custody Transfer System

A standard LACT skid is a complex assembly of mechanical and electronic components. Each part must work in harmony to maintain the integrity of the measurement.

1. Charge Pump

The charge pump provides the necessary pressure to move the fluid through the skid at a constant flow rate, which is essential for meter accuracy.

2. Air Eliminator

Air or gas bubbles in the liquid stream can cause significant measurement errors in flow meters. The air eliminator (or deaerator) removes entrained gases before the fluid reaches the measurement section.

3. BS&W Monitor and Probe

This component measures the percentage of water and sediment in the oil. If the BS&W levels exceed a pre-set limit (typically 0.5% to 1.0%), a three-way diverter valve is triggered to send the non-compliant fluid back to a treat tank or separator.

4. Flow Meter

The heart of the skid is the flow meter. Common types include Positive Displacement (PD) meters or Coriolis mass flow meters. Coriolis meters are increasingly preferred due to their ability to measure mass, density, and temperature simultaneously without moving parts.

| 5. Level Instrumentation

While the flow meter measures the transfer, level sensors on the source tanks and the skid's internal vessels (like the air eliminator) ensure the system operates within safe limits. High-accuracy radar or ultrasonic sensors are often used to monitor the supply levels to prevent the pump from running dry.

| Measurement Principles in LACT Operations

To understand how lact skids maintain accuracy, it is necessary to examine the underlying measurement principles of the instrumentation used.

| Flow Measurement: Coriolis vs. Positive Displacement

Coriolis Principle: This utilizes the Coriolis effect, where fluid moving through vibrating tubes causes a phase shift proportional to the mass flow rate. It is highly accurate and unaffected by changes in fluid viscosity or density.

Positive Displacement: This mechanical method traps a specific volume of fluid in a chamber and counts the number of times the chamber is filled and emptied. It is reliable but requires more maintenance due to moving parts.

| Level Measurement Principles

Level measurement is critical for inventory management and pump protection within the broader production facility feeding the LACT unit.

Radar (ToF): Time-of-Flight (ToF) radar sends a microwave signal to the liquid surface. The time it takes for the signal to return determines the distance. This is ideal for crude oil as it is non-contact and unaffected by vapor or pressure.

Hydrostatic Pressure: This measures the pressure exerted by the liquid column. While simple, it requires constant fluid density to remain accurate.

Magnetic Level Gauges: These use a float with an internal magnet that moves a series of flags or a transmitter on the outside of a chamber, providing both a visual and electronic reading of the tank level.

Level Instrumentation for Upstream and Midstream Tanks

Welk provides a range of industrial level measurement instruments that are essential for the tanks feeding lact skids. Ensuring that the source tank has sufficient head pressure and volume is the first step in a successful custody transfer.

Technology	Application in LACT Systems	Key Advantage
Radar Level Meters	Main storage tanks and buffer tanks	High precision ($\pm 1\text{mm}$ to $\pm 3\text{mm}$), non-contact.
Ultrasonic Sensors	Water-cut tanks and open sumps	Cost-effective for non-volatile fluids.
Magnetic Level Gauges	High-pressure separators	Robust visual indication and high-temperature resistance.
Level Switches	High/Low alarm for pump protection	Reliable fail-safe to prevent overflows or dry runs.

For engineers looking to integrate high-reliability sensors into their automated systems, the Main Page offers a comprehensive overview of radar and ultrasonic solutions tailored for industrial automation.

Selection Criteria for LACT Skid Instrumentation

When designing or specifying a LACT unit, several factors must be evaluated to ensure the system remains compliant with API (American Petroleum Institute) standards.

- Fluid Properties:** Consider the viscosity, density, and corrosivity of the crude oil. High-sulfur (sour) crude requires stainless steel or specialized alloy components.

2. **Flow Rate:** The skid must be sized to handle the peak production output of the lease. Over-speeding a meter leads to premature wear and inaccuracy.

3. **Environmental Conditions:** In regions with extreme cold, the skid may require heat tracing and insulation to prevent the oil from thickening or waxing, which would stall the measurement process.

4. **Accuracy Requirements:** Custody transfer typically requires a linearity of $\pm 0.25\%$ or better. This necessitates high-end Coriolis meters and frequent "proving" (calibration against a known standard).

5. **Regulatory Compliance:** Ensure the components meet API MPMS (Manual of Petroleum Measurement Standards) Chapter 6.1, which specifically covers LACT systems.

| Installation Guidelines and Best Practices

Proper installation is as critical as the quality of the components themselves. Even the best lact skids will fail to provide accurate data if installed incorrectly.

Foundation and Leveling: The skid must be placed on a stable, level concrete pad. Any vibration from the pump or nearby equipment should be dampened to avoid affecting the Coriolis meter's sensitivity.

Upstream Piping: Ensure there is sufficient straight pipe run before and after the flow meter (if using PD or turbine meters) to eliminate turbulence. Coriolis meters are generally less sensitive to piping configurations but still benefit from stable flow.

Level Sensor Placement: When installing radar level meters on the supply tanks, avoid placing the sensor near the fill inlet or internal obstructions like heating coils or agitators, as these can cause false echoes.

Grounding and Shielding: All electronic instrumentation must be properly grounded to prevent electrical noise from interfering with the low-voltage signals from the flow and level transmitters.

| Common Challenges and Risk Mitigation

Operating lact skids in remote oilfield environments presents several challenges:

Paraffin and Scale Buildup: Crude oil can deposit wax or scale on the internal surfaces of the meter and BS&W probe. Regular cleaning and the use of chemical inhibitors are often necessary.

Gas Slug Interference: If the upstream separator fails, a "slug" of gas can enter the LACT unit. This can over-spin a PD meter or cause a Coriolis meter to lose its drive gain. High-quality air eliminators with level-controlled vent valves are the primary defense.

Power Fluctuations: Remote sites often rely on solar power or generators. Integrating a UPS (Uninterruptible Power Supply) ensures that the flow computer does not lose data during power transitions.

| Frequently Asked Questions (FAQs)

Q: How often should a LACT skid be proved?

A: Proving frequency is usually determined by the contract between the buyer and seller, or by local regulations. Common intervals are monthly or after a certain volume of fluid has passed through the meter.

Q: Can LACT skids handle produced water?

A: While LACT skids are designed for oil, they include a BS&W monitor to detect water. If the water content is too high, the system diverts the flow. Separate measurement systems are typically used for produced water disposal.

Q: What is the difference between a LACT unit and a ACT unit?

A: A LACT unit (Lease Automatic Custody Transfer) is used at the production lease. An ACT unit (Automatic Custody Transfer) is a more general term used at pipeline terminals or refineries where the fluid has already been treated to pipeline quality.

Q: Why is temperature compensation necessary?

A: Crude oil expands and contracts with temperature changes. To ensure a fair transaction, volumes are corrected to a standard temperature (typically 15°C or 60°F) using API gravity tables.

For more information on selecting the right level measurement technology for your industrial applications, visit the [Main Page](#) to explore our full range of radar, ultrasonic, and hydrostatic solutions.