

Manual of Petroleum Measurement Standards Chapter 6.1

Lease Automatic Custody Transfer (LACT) Systems

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Lease Automatic Custody Transfer (LACT) Systems

6.1.1 Introduction

This publication has been prepared as a guide for the design, installation, calibration, and operation of a lease automatic custody transfer (LACT) system.

A LACT system is an arrangement of equipment designed for the unattended custody transfer of liquid hydrocarbons from producing leases to the transporting carrier. The system must determine net volume and quality, provide for fail-safe and tamperproof operation, and meet requirements of accuracy and dependability as agreed to by mutually concerned parties, such as the producer, the transporter, the royalty owner, and federal, state, and municipal regulatory bodies.

6.1.1.1 Compliance

Compliance with the provisions of this standard may result in an approach to accuracy or may establish safeguards that are not necessary under all conditions. When not required, those portions of this standard not considered applicable may be disregarded with the mutual agreement of all parties concerned.

The compulsory verb form "shall," while not necessarily binding for all conditions, has been used when a deviation from the standard is likely to adversely affect the satisfactory operation of a system that is designed for optimum operation under typical producing conditions.

6.1.1.2 Future Developments

Although this standard presents the concurrence of the industry on system requirements for lease automatic custody transfer, it is not intended in any way to restrict future developments. Equipment now exists in the design or field-proving stages that may further improve the art of lease automatic custody transfer. The industry encourages such developments, and when concerned parties mutually agree to use such systems or components, every effort should be made to expedite their use and standardization.

6.1.2 Scope

This publication describes the metering function of a LACT unit and is intended to complement API Specification 11N, *Specification for Lease Automatic Custody Transfer (LACT) Equipment*. LACT equipment includes a meter (either displacement or turbine), a proving system (either fixed or portable), devices for determining temperature and pressure and for sampling the liquid, and a means of determining nonmerchantable oil. Many of the aspects of the metering function of a LACT unit are considered at length in other parts of this manual and are referenced in 6.1.4.

6.1.3 Field of Application

The field of application of this publication is the unattended and automatic measurement by meter of hydrocarbon liquids produced in the field and transferred to a pipeline in either a scheduled or a nonscheduled operation.

NOTE The information contained in Chapter 6.7 should also be considered when measuring viscous fluids by meter.

6.1.4 Referenced Publications

Many of the aspects of the metering function are discussed at length in other parts of this manual. Please refer to the following chapters for more information.

API Manual of Petroleum Measurement Standards

Chapter 4, *Proving Systems*

Chapter 4.8, *Operation of Proving Systems*

Chapter 5.1, *General Considerations for Measurement by Meters*

Chapter 5.2, *Measurement of Liquid Hydrocarbons by Displacement Meters*

Chapter 5.3, *Measurement of Liquid Hydrocarbons by Turbine Meters*

Chapter 6.7, *Metering Viscous Hydrocarbons*

Chapter 7, *Temperature Determination*

Chapter 8, *Sampling*

Chapter 8.2, *Automatic Sampling of Petroleum and Petroleum Products*

Chapter 9, *Density Determination*

Chapter 10, *Sediment and Water*

Chapter 12, *Calculation of Petroleum Quantities*

Chapter 12.2, *Calculation of Liquid Petroleum Quantities Measured by Turbine or Displacement Meters*

Other API Standards

Specification 11N, *Specification for Lease Automatic Custody Transfer (LACT) Equipment*

6.1.5 Requirements for All LACT Systems

The requirements for all LACT systems are as follows:

- a) When hydrocarbon liquids are measured and transferred, the fluid should be stable to permit subsequent storage during transportation without abnormal evaporation losses.
- b) During custody transfer, provisions shall be made for determining net standard volume (see Chapter 12).
- c) Temperature measurements, recordings, or corrections applicable to volumetric measurement shall be made in accordance with Chapter 7.
- d) Temperature and pressure measurements (either recorded or indicated) shall be taken, and corrections applicable to volumetric measurements shall be made in accordance with Chapter 12.2. The method of performing temperature compensation is a matter of negotiation but should be accomplished by use of volume-weighted temperature-averaging devices or temperature compensators for optimum accuracy.
- e) A representative sample of transferred oil for determining density (API gravity), sediment and water content, and any other physical properties required shall be obtained (see Chapter 8, Chapter 9, and Chapter 10).
- f) The merchantability of hydrocarbon liquids should be established when they are transferred; that is, when the liquids are within a specified density (API gravity) range, do not contain more than a specified sediment and water percentage, are at an acceptable temperature, and are of an acceptable Reid vapor pressure. A means shall be provided to stop the flow of oil to the carriers system and to the sampling system if the oil becomes unmerchantable.

- g) A means should be provided to control flow rates, periods of flow, and net quantities of oil delivered into the carriers system.
- h) A means shall be provided to stop the flow of oil into the carrier's system at or before completion of delivery of the leases assigned allowable capacity.
- i) The control and recording system shall include fail-safe components to prevent mismeasurement or hazardous operating conditions in the event of a power or system functional failure of any of the system's components required for the LACT.
- j) All components of the system that require periodic calibration and/or inspection should be accessible for inspection by all parties involved in the custody transfer transaction. Adjustment, repair, or replacement will be performed by those responsible for the operation of the system. The design of the system shall provide a means for readily detecting leakage throughout the system, for example, double-block and bleed-type valves, sight drains, or pressure instruments.
- k) The piping system shall not have connections or bypasses that would permit liquids to be transferred without measurement and shall be designed or equipped so that a reverse flow of liquid through the measuring device cannot occur.
- l) A means shall be provided to lock or seal components that affect control or indicate measurement of quantity or quality. Unless this requirement has been specifically waived, such components shall be unlocked or unsealed only after prior notice to and consent of the parties concerned.
- m) System malfunctions shall be anticipated, and deliveries that could occur during such periods shall be estimated. This requirement may be met by independent gross fluid delivery recording systems, that is, by using a dual-head meter and temperature recorder, by using a meter in series, or by recording temperature or pressure or other instruments that indicate periods of flow. In installations where such apparatus is not used, prior agreement should be established for calculating or estimating procedures that will be followed in instances of measurement system malfunction.
- n) Sediment and water content and density (API gravity) measurements shall be made from composite samples obtained by automatic samplers of acceptable design. Samplers shall be installed in accordance with Chapter 8.2.

6.1.5.1 Sampling

In most cases, accounting for a crude oil run is determined on the basis of net standard volume, which includes corrections for meter factor, temperature, pressure, and sediment and water content. Therefore, the composite sample accumulated in a run period and any portion used for the determination of density (API gravity) and sediment and water content must represent all crude oil delivered during that run period.

When density (API gravity) and sediment and water content are based on a sample from the composite sample of the run, the procedures used must ensure that this secondary sample is representative of the composite sample (see Chapter 8 for additional details). The sampling should be proportioned to the flow rate through the meter.

6.1.5.2 Maintaining Allowables

When regulatory agencies apply production allowables, runs from the LACT system shall conform to but shall not exceed these allowances. Automatic means shall be used to accomplish this requirement. The system must be fail-safe, tamperproof, and sealed so that neither the producer nor the carrier can change the arrangement without the consent and/or knowledge of the other party.

System devices must be capable of being pre-set and verified for a predetermined volume that will approach but not exceed the lease allowable. When the predetermined volume has been reached, the arrangement used must prevent any further movement of oil from the lease until it is manually reset. The arrangement