HighWire Foundation for Inbound Integrations Requirements

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Summary

This document attempts to deliver a foundation for the inbound integrations requirements of a measurement system for Information / Technology folks that will be involved in design and development of that capability.

Definitions

Measurement / Movement

The transfer of product from one side (origin) of a measurement point to the other side (destination). This could be via a meter, gauging a tank before and after a load / unload.

Daily Measurement

Are record(s) of movements that cover a 24-hour period. A persons could be confused because it is called a daily measurement why there would be more than one. Often, they are broken into multiple records to align to batch measurement. Record is the key word here; the points of a measurement are related to a starting and ending date. Pressure, temperature and most other points are not the instantaneous values at the time of recording the measurement. They are volume weighted averages of the points used to calculate the volume during the timespan between start and end of moving the volume.

Batch Measurement

A batch measurement is used to measurement the movement of product over a specific amount of time that could be less or greater than a day. Batches are created for several different reasons. They are used to identify the period of time that a sample (gravity, bsw, etc) applies to. They are also used to track either product specific or customer specific movements. Product tracking is needed in crude because they ship different grades on the same pipeline. Customer specific batches track how much meter A delivers to customer A vs. customer B.

Gauge or Line Fill / Static Measurement

The measurement for inventory in a tank or pipeline at a specific point in time. How much volume is in that tank. A tank gauge is either automated or done by hand. Automated gauges generally cannot supply all of the values that a hand gauge supplies; however, they can be done more frequently (hourly). The hand gauge is usually done because there is either a contractual obligation or there is no automation. Automated have less data points because of lacking / expense of the technology. Line fill is calculated by knowing either total water volume of a pipeline or segment or in the case of batching pipelines, the amount of each grade that has gone into a line and has not come out.

Grind Out

The value of crude depends on its density and also crude has water in it which needs to be accounted for (Not included in custody volume). This is why the company does a grind out. A sample pot is put near the meter to collect a sample over time of the crude moving through a meter. This sample is collected on an interval defined in the agreement with the producer / shipper. These values are applied to the collected measurements to produce a final net volume. In other words, it is used to determine the density and water content of the crude that flowed over that time. Sometimes the density is not used because the meters density is considered more reliable (Coriolis Meters). Grind out is done for movements and static measurements.

Meter Prove

A way of determining the error correction needed by a meter by testing against a known volume or a calibrated meter. The factor is used as part of a calculation of gross standard volume from indicated volume.

Movement Business Process Types

Gathering Measurement Business Process

Gathering is the process of collecting crude oil from producer well or other shippers. The crude is either sent to a station via pipeline or is collected from a tank battery and trucked to that same station. Meter tickets are generated for gathering systems to inform the producer / shippers of how much custody transfer volume the company has received. These meters are generally proved on a contracted period of time and a sample pot is collected for a prescribed period of time. Meter tickets are sometimes broken up by prove periods or grind out periods which can be considered like a batch. Measurement groups sometimes collect just daily records and then sum them up to make a meter ticket for gathering customers. Sometimes they collect both daily records and batch records. With the daily being an estimate for balancing and the batch being the reported values (Usually associated with collecting the grind out).

Batching Measurement Business Process

Batching pipelines are generally downstream of gathering pipelines and need to tracked individually (Batch Measurement) because either they move different grade of crude or they deliver to different customer that have to be tracked individually.

Daily / Batch Measurements

Relationship of the parts

It is important to realize that a measurement is a related set of points for a time span. It is not individual points collected at an interval. Example points would be temperature / pressure, you can collect temperature / pressure over the time span of the measurement and that would **not** be the temperature / pressure needed for measurement. Because flow is not constant the temperature / pressure needed would be the volume weighted average temperature / pressure over the span of the movement. Modern flow computers usually assemble these records.

Usage in Balancing

The very minimum measurement that can be used in a measurement system would be:

- Start/End Date
- Measurement Device Identifier (Meter Number)
- GSV Totalizer End (Totalizer start comes from the previous record end)
- Product (If Batching Pipeline)
- Batch reference (If Batching Pipeline)

Ok; however, this was done in the early days because of technology limitations.

Usage in Re-Calculations

The minimum you would not be able to re-calculate / correct the measurement if you found out the temperature / pressure / meter factor was wrong would be:

- Start/End Date Time
- Measurement Device Identifier (Meter Number)
- Indicated volume
- Meter Factor
- Average Temperature
- Average Pressure
- (Some form of density)
- Product (If Batching Pipeline)
- Batch reference (If Batching Pipeline)

Better; however, there is no way to cross check the numbers.

Usage in Validation

The minimum you would not be able to validate / cross check measurements would be:

- Start/End Date Time
- Measurement Device Identifier (Meter Number)
- Indicated volume
- Meter Factor
- Average Temperature
- Average Pressure
- (Some form of density)
- API@60

- IV/GSV/Mass Totalizers
- CTL
- CPL
- Product (If Batching Pipeline)
- Batch reference (If Batching Pipeline)

Much Better; however, the flow computer has more and there could be justification for larger volume meters for collecting it.

Gathering Pipeline Batch Measurement Only

Some companies utilize just the batch measurement in a monthly ticket and then apply grind out.

Ok; however, only monthly balancing would be possible which can cause surprises that could be detected earlier.

Gathering Pipeline Daily Measurement Only

Some companies utilize just the daily measurement assembled in a monthly ticket and then apply grind out. Values like temperature and pressure etc. are weight averaged from the dailies.

Better; however, with the advent of modern flow computers you can program them to batch on the month or to be batched when grind out is gathered. Some gathering meters are so small it is not worth batching the flow computer.

Gathering Pipeline Daily / Batch Measurement

Companies collect dailies for balancing / scheduling purposes; however, their golden number comes from a batch record produced by a flow computer which they then apply grind out to.

A ticket adjustment is calculated when the batch comes in that adjusts the final balance for the month.

Best, the dailies values are a cross check against the monthly numbers.

Batching Pipeline Batch Measurement Only

Some companies utilize just the batch measurement(s) and then apply grind out.

Ok; however, only monthly balancing would be possible, unless all batches don’t cross a day.

Batching Pipeline Daily Measurement Only

This is not possible unless the dailies are broken on the day and on batch end and have a batch identifier.

Ok; nothing to cross reference against and a missing daily could cause an issue

Batching Pipeline Daily / Batch Measurement

Companies collect dailies for balancing / scheduling purposes; however, their golden number comes from a batch record produced by a flow computer which they then apply grind out to.

A ticket adjustment is calculated when the batch comes in that adjusts the final balance for the month.

Dailies would need to broken on the batch and the day, or utilize a split functionality via totalizers.

Best, the dailies values are a cross check against the monthly numbers.

Tank Gauging

Methods for gauging collection

Radar gauges

Records sent to the measurement system and collected the same way measurements are.

Hand Gauges

A person gauges the tank manually and either enters the tank gauge directly or the gauge document is uploaded.

Line Fill

Methods for line fill collection

Leak control Feed

Many leak detection systems require line fill to understand if there is a leak and often that can be shared with a measurement system via a feed.

Manually Entry

Many times, the line fill change is not caused by the distinction of products in the line and in gathering many times it is cause by shutting down a pipeline segment for maintenance. These are usually manually entered into the measurement system.

Batch Tracking

This is the process of relating movements in and out of a pipeline and then calculating what is left in the line.

Density / Temperature Correction

This is similar to batch tracking; however, it uses values (temperature, density) needed to adjust a base volume (engineered volume) that is known to be in the pipeline or pipeline segment.

Grind Out Measurement

Methods of applying grind out

Grind out is part of a ticket collected at the meter manually

Grind out will be uploaded with the batch measurement

Ok; however, this is usually because of manual collection of measurement

Each ticket is edited individually

The analyst will find and edit each meter ticket with grind out

Ok; however, this is a lot of additional hours of work

Grind out measurements uploaded and applied automatically

The grind out is collected in a tool or spreadsheet and then is automatically applied to the applicable meter tickets.

Better; because, there would be fewer keying errors etc.

Grind out comes in as part of the daily / batch measurement automatically

Newer flow computers have ability to test for BSW as they calculate the volumes.

Best; because no human intervention. This is new technology and the expense is a consideration!