OPERATIONAL SEQUENCE OF AUTOMATIC TANK BATTERY
SHOWN ON NATIONAL TANK COMPANY DRAWING A-11460

This installation is very similar to present units now operating successfully for the Graridge Oil Corporation and The Ambassador Oil Corporation in the Caprock Field of New Mexico. The drawing shows a single battery operation hooked up to use a single meter prover.

This battery will perform the following functions:

1. Run only merchantable oil to the pipeline.
2. Measure the volume of the oil run with a provision for temperature compensation.
3. Provide a means of determining API gravity and BS&W content.

The sequence of operation to perform these functions is as follows: (refer to Drawing A-11460 attached)

1. Lease production, after passing through separating and dehydrating equipment, is flowed into vented merchantable oil monitoring tank through perforated down comer.

2. The merchantable oil monitoring tanks perform the following operation: From the central mid point section of the monitoring tank, oil enters and is piped to the exterior of the tank by means of a 2" tube and is caused to flow downward through the probe of an Instruments, Inc., BS&W Monitor, and the oil enters the suction of a 5 gpm gear rotary pump and is pumped back into the base of the monitoring tank. The function of the BS&W Monitor is to determine the actual BS&W content of the oil passing the probe, (A), the mechanical limits of this monitor are set for a maximum of .5 to .8 of one percent BS&W content and as long as the content remains below this point, the oil is allowed to leave the monitoring tank by valve V-3 and enter the pipeline surge tank through a perforated down comer.

3. In the event the BS&W Monitor gives indication of BS&W content above mechanical setting, the instrument by electrical control will close valve V-3, diverting the oil from pipeline sales tank, and will cause pump P-1 to circulate the oil in the monitoring tank back to the separating and dehydrating vessel until such a time as the monitoring instrument indicates a clean oil condition exists in the monitoring tank. At that time the P-1 pump will shut down and valve V-3 will open to pipeline sales. A chemical injection pump will inject oil treating compounds any time pump P-1 is operating

4. As a means of eliminating a possible high bottom condition in the monitoring tank, a time clock actuator is also mounted in the circuit to pump P-1 which will allow a pre-determined time circulation of oil from the base of the monitoring tank back to the dehydrating tank.

5. If a bad oil condition continues to exist in the monitoring tank for some extended period, the level in the monitoring tank will rise to a pre-determined point and will bypass the sales tank and will go to surplus oil storage tanks in the battery. Oil will continue to the surplus storage tanks until such a time as the BS&W Monitor indicates clean oil at which time valve V-3 will open and clean oil will then go to pipeline sales tank.

6. When clean oil is again indicated in the monitoring tank, valves V-8 and V-12 in the base of the surplus storage tank can be opened to recirculating pump P-1 and by means of a mechanical switch on pump P-1, this oil may be recirculated back through the dehydrating system and again enter the monitoring tank.

7. Under normal operation the tank battery valves will be in the indicated positions:

   Valve V-3, open; valve V-4, open; valve V-5, closed;
   Valve V-6, closed; valve V-7, open; valve V-8, closed;
   Valve V-9, closed; valve V-10, open; valve V-11, open;
   Valve V-12, closed; and valve V-13, closed.

8. Valve V-6 is included in the piping arrangment so that manual gauging operation of all three tanks in the battery may be assumed at any time that any malfunction should occur in the automatic operation of the battery.

9. In the sequence of operations, it is noted that valve V-7, the pipeline valve on the pipeline sales tank, is the only valve open to the automatic measurement skid when the meter is in use.

10. Under normal automatic operation (valves V-14, V-18 and V-19, open and valves V-15, V-16 and V-17 closed) clean oil enters the metering skid through pressure switch "B" which starts and stops pump P-3 through its' control panel C-2. This action is determined by the hydrostatic head of fluid in the pipeline sales tank and should be set to operate on start up at the 14' level in the tank to shut off at the 3' level in the tank.

11. The clean oil now under constant pressure from gear pump P-3 enters and passes through the probe on the sampler, item "C", which samples and stores in its own separate container under pressure, a measured volume of oil for each barrel passing through the sampler.

12. The oil then enters and passes through strainer, item "D", so that all foreign material may be removed from the clean oil stream which could possibly lock or make inoperative the meter. The oil then enters air eliminator, item "E", where all free gas and air is removed so that a solid column of fluid will enter the meter chamber.

13. Oil entering the meter, item "F", passes through a temperature condensating chamber which controls the gross barrel counter in the Smith S-12 Meter and corrects the meter reading to an API volume at 60 degrees F. In the meter is included a ticket printer with locking device which necessitates the stamping of the ticket prior to removal from the meter, and assures both the seller and the pipeline of a written figure showing the calibrated volume of fluid passing through the system.

14. The oil then enters and passes through the back pressure valve, item V-20, which maintains a constant pressure on the metering system and assures a true volume of oil processed.

15. At this point the oil may be diverted to the meter prover attached to this assembly which is calibrated under U. S. Bureau of Standards approved system of calibration, or the oil may be diverted to pipeline for continuous automatic sales.

16. During meter proving operations valves V-16, V-17 and V-19 are closed and valves V-14 and V-15 are open so oil goes from pump P-3 through the meter run to the meter prover. After the oil has been metered into the meter prover, it is then pumped directly into the pipe line by closing valves V-14, V-15 and V-18 and opening valves V-16, V-17 and V-19.

To provide fail safe operation, all controls and valves are designed to close in the event of gas or electric failure. On return of gas or electric service, normal battery operation is resumed automatically.