Simplified Production Testing

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CHECKING PRODUCTION OF OIL WELLS

During the past few years a new method of checking the production of oil wells has been developed. This method is based on intermittent sampling and can be accomplished in two ways; by taking samples by hand from the bleeder at such times as are dictated by a watt demand meter, or by use of a mechanical device which will take a sample at equal intervals. In each method the production is obtained through analysis of the samples taken. Although the two methods are somewhat different, they do have this common characteristic -- they make unnecessary the use of bulky test tanks or separate storage facilities at the tank battery.

We will first discuss the use of a KW demand meter which, of course, may only be used on wells which are powered by an electric motor. The easiest way to use such a meter is to connect a special socket into the motor controls. When a test is desired, the socket based meter is plugged in. The recording KW demand meter maintains a constant record of the load being pulled by the motor. We normally use a 2-day chart when checking oil wells but it is an easy matter to change a gear, which will make it possible to get 8, 16, or 32-day records.

Chart 1 shows a well that has pumped off before the end of its pumping cycle. This chart will show that whenever there is a change in density, or in the rate at which the fluid is being pumped, there is a corresponding change in the load on the motor and this is reflected on the chart. In order to determine a well's production, the demand meter should first be allowed to record one full day's operation.

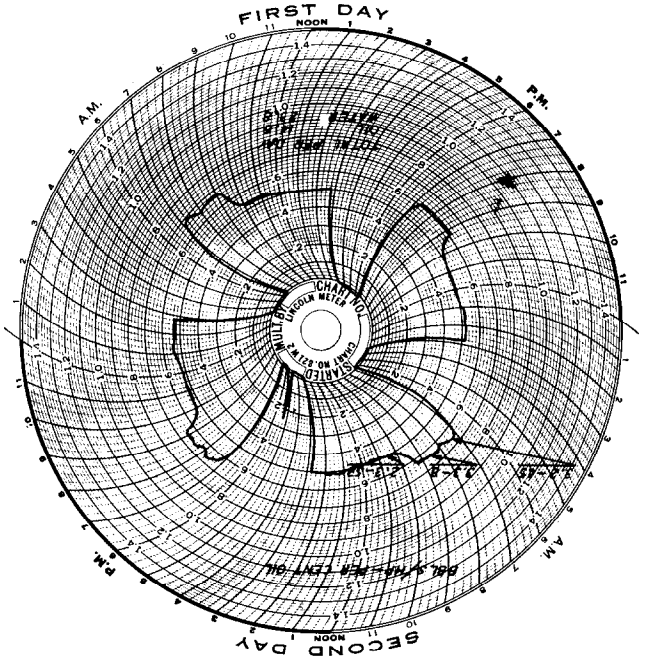


CHART 1

Study Of Chart

A study of the chart obtained will indicate the time when samples should be taken. These samples are ordinarily taken by opening the bleeder and catching the production in a small container. A six gallon can may be used for this purpose except in cases where the well is pumping against considerable pressure; then, a larger can should be used. It is very important that the pressure in the flow line from the well should be duplicated in the sample line or bleeder, so that the well may be operating under the same conditions during the time of sampling. It is also necessary to determine, as close as is reasonably possible, the time consumed in taking this sample (such as one or two minutes).

Fluid Analyzer

The next step is to determine the oil/water ratio in the sample taken. This may be done easily and quickly by use of a fluid analyzer. This is a simple beam balance with a special gallon bucket hanging from it. Attached to the beam is a chart, having lines which have been etched in stainless steel. Charts have been made up for each 5° API from 10° to 60° inclusive.

To use this fluid analyzer, the weight per gallon of salt water encountered in the well must be determined. We have found that the salt water density may change from lease to lease but it is normally constant on a lease. The salt water used in this test is drained off at the separator or from the tank battery. When making the oil/water determination the gallon bucket is filled with crude and the counter-weight moved along the beam until it is balanced. There is a small wire set into the counter-weight. With the beam in balance, it is only necessary to see where the wire crosses the appropriate salt water density line, and from there look along the nearer sloping line, which will give you the percentage of oil in the crude. If, for instance, an operator is producing 38° API oil, he can use an analyzer equipped with a 40 chart and be certain that he is within not more than 3% of the correct percentage ratio. This analyzer is made for use on samples taken directly from the bleeder and has proved to be a very handy thing.

A modification of the fluid analyzer is necessarily somewhat more elaborate. With this device, however, one can follow practically the same procedure using any volume of oil. By this means, the percentage of oil in any volume of crude can be quickly determined.

Use Of Well Tester

The second method of checking the well's production can be carried out by using a well tester, shown in Fig. 1. This device automatically does the work we did by hand with the electric demand meter. The object of this device is to collect a series of samples from which the well production can be obtained. This is done by setting a 3-way valve into the flow line and opening the valve so that the entire production from one stroke is detoured into a small container. This can be done by taking what will be called a sample stroke as often as every 10 1/2 strokes, or as far apart as every 126 strokes. Bear in mind that the timing of opening and closing the valve is controlled entirely by the motion of the walking beam itself.

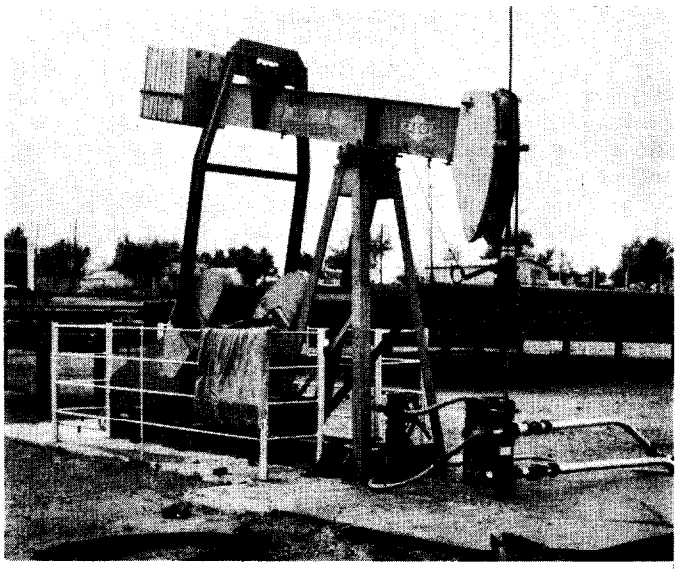


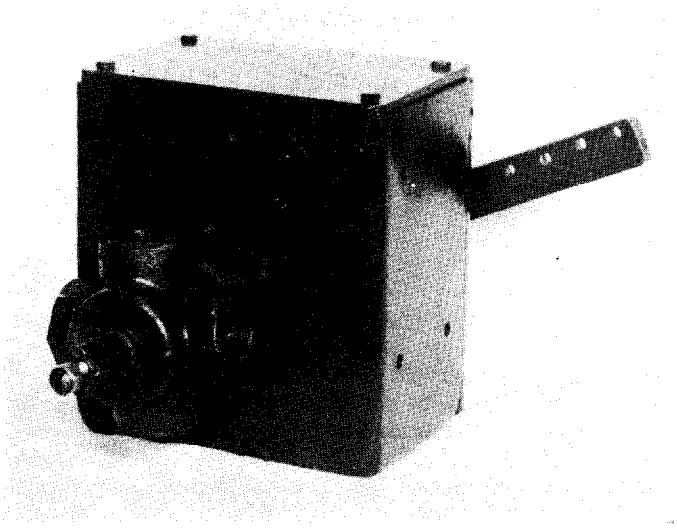
Fig. 1 LAMBERT WELL TESTER

On one end of the unit there is a small arm by means of which one can cause the ratchet to pick up from one to six teeth. Of course, the more teeth the ratchet picks up the faster the ratchet wheel will turn, and samples will be taken at closer intervals. The figure of 126 is used so that one gallon of fluid in the sample container will indicate a production of 3 barrels. When the ratchet picks up two teeth you would have 1 1/2 barrels of production and this same ratio applies for any range.

On the opposite end of the unit is an operating arm which is connected by a small cable to either the walking beam or the polish rod. It only requires 8" of travel to operate this arm and actuate the inner mechanism. When the cable is attached ahead of the main pillow block, the valve is opened and closed on the up stroke. However, this action can be initiated on the down stroke by attaching the cable behind the main block. When the cable is attached close to the main block, the entire length of stroke is used to throw the valve. If the cable is attached to the polish rod, this action is performed just at the end of the stroke.

Total Volume Of Fluid

Incidentally, the line from the well to the valve can enter any one of the four openings and the opposite



opening is closed with a standard one-inch pipe plug. Of the remaining ports, one leads back into the flow line and the other leads back to the sample container. At the end of the test period, the volume of crude in the sample container is measured with a dip-stick. When this is multiplied by the ratio which was set into the testing unit by the operator, the total volume of fluid is obtained. The percentage of oil in this sample can easily be determined by one of the two analyzers, as previously mentioned. It is important to set the same pressure in the sample line as the well is pumping against into the flow line.

Most operators prefer to attach the well tester to some part of the pump jack frame and make the connections to it with flexible hose. Others attach the testing unit to the well head and connect it permanently into the flow line with rigid pipe. Using this system, the well is always pumping through the tester and, when a check of the production is required, it is only necessary to attach the cable to the desired point. It is worthy of note that this type of testing unit can be used on any pumping well, no matter how it is powered.