Development and Operations in the Panhandle Field

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In the Texas Panhandle one of the greatest difficulties of operation is the paraffin situation. Oil in that field ranges from 83° up to about 90°, as it exists in the sand. It is from 2900 to 3000 ft. deep, and should be up around 120 to 150°, as compared to other oils in the United States. Furthermore, the oil in the Panhandle congeals to a solid ball of wax at from 55 to 60°, which gives a margin on an average of about 20°, to get oil from the sand into the pipe lines or points of use.

Gas Pressure

The gas pressure in the Panhandle field is about 420 lb., which is about half the hydrostatic head. It is not sufficient to flow the wells that we term the flow wells in the Panhandle. They are not what I would call flow wells, because if you shut in one of them and open it up again the well is dead, and it is necessary to swab or agitate the gas with the oil to make it come back. The oil in most of the so-called flow wells is produced in a spray form. The gas factor is extremely high and there is an enormous amount of gas in the field which has been wasted.

It is estimated that the original supply of gas was about 120 quadrillion feet. In other words, there was enough gas in the Panhandle originally to run the State of Texas for 166 years, if the gas were consumed every day of the year at the rate of the peak load in Texas during the closing month of the year. The gas is in a lime above the main pay. It varies from nothing up to 500 ft. thick at different points in the field. Between the big gas and the pay it varies from nothing up to 150 ft., which in one part of the field is in a lime and in another part of the field in a granite wash. There is a shale break which varies from nothing up to 100 ft. or thereabout. It is different in different parts of the field.

It is impossible to drill in this gas with the hole loaded. Unhydrated lime is put into the hole and then water. The water slackens down the unhydrated lime and sticks the tools in the hole. For that reason they are unable to use a rotary.

We at present, and others I believe, are working on a method of trying to doctor this solution, so to speak, to enable us to drill with a hole loaded with fluid and to save the gas. At the present time I estimate that 100 million cubic feet of gas is wasted in the Panhandle daily.

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The pressures indicate that the upper gas is in contact with the oil bed, not all over, but in spots. We do not know where the spots are but the pressure declines the same in each one and since they are both less than the hydrostatic head it leads us to believe that they are in contact, and the points where they are, in coarse sands or the coarse porosity between the two are probably the areas of most prolific production.

In the oil sand itself, or in the lime rather than sand, there are strips of shale and when water hits this shale it swells up to several times its volume and is difficult to handle. It is necessary to fight some of those wells for months to get them cleaned out. If a well is on production and is shut in for 2 or 3 days it will be 2 or 3 months before it can be brought back to normal production. That is due to mud slacking down and plugging the sand around the well and also due to the accumulation of paraffin on the face of the well bore. After you start producing again, if it is a paraffin of the temperature of the oil, the oil will gradually cut it out. On the other hand, we find that in some of the wells the paraffin is actually keeping the gas in with the oil, and when it does we get an exhaustion which refrigerates the oil to such a point that the paraffin congeals and that paraffin is more or less in a helpless form in the oil. It then takes usually 1 or 2 months in cleaning out.

Some of the companies in the Panhandle field have used hot water and let it stand on the face of the sand to dissolve the paraffin. Others have used butane or high gravity gasoline to dissolve the paraffin.

It is necessary in drilling in to provide suitable minerals in the well to keep caving mud from rolling in and instead of fighting the mud out we find it better to properly line the well and keep it dry in the first place.

Paraffin Difficulties

In flowing wells most of the paraffin is floated through the casing or swabbed up through the casing and we get a gradual accumulation of it which becomes bigger as we approach the well head. A scraper has been developed in that field which successfully cuts down the paraffin and cleans the casing and which will not ruin the tubing. It consists of a special cutter, working both up and down, scraping the paraffin clean of the casing.

In pumping wells in that territory it is necessary to blow them very frequently. For that reason we have recently been experimenting with the gas lift and trying to make it work. In our experiments we have come in contact with problems which have not been dealt with in any other field in the United States, because if we are able to make the gas do the work on the oil it necessarily must expand and in so doing drops in temperature. This temperature drop, if we use lines of sufficient size, causes the paraffin to congeal in the flow lines and in a short time the

lines become closed up and they have to be cleaned out. In pumping wells it is necessary to clean out in 4 or 5 days.

The induction of live steam at the casinghead has given us satisfactory results in many cases. The steam serves to melt the paraffin down and it floats out with the oil.

In the gas lift we try to avoid the paraffin situation by the application of hot gas. In flowing through the tubing we are able to flow a well about 5 days and then it plugs up almost solid and the production gradually decreases. The hot gas going down keeps the tubing clean at the upper 700 ft., where the worst condition exists, and by the time it gets to 700 ft. it has given up all of its heat and from that point down to the liquid level the paraffin accumulates and causes trouble.

Heating the Pipe Lines

Another important method of keeping production up in the Panhandle field is to provide suitable heaters on every phase of the pipe line for this oil. Outside of getting the oil to the well head we have to lose temperature in getting the oil into the pipe lines. It is necessary to install heaters of proper size and design at the well in order that you may heat the flow line. Some 15 days ago they had a well in the Panhandle the temperature of the oil in which dropped to 83 or 84° and the production dropped just about as the temperature did because the flow lines all over the field were frozen up, and it is very difficult if you do not have adequate heat at all times to keep them going. In addition to the heat it is necessary to have a suitable means for blowing out flow lines and tanks. If for any reason the well is shut down, unless there is a heater on the flow line, the paraffin will congeal in the flow line, plugging it absolutely tight. Our instructions are to blow out the flow lines at any time the well may have to be shut in for repairs or other operations.

The installation of the gas lift, if successful, and we have hopes that we can make it successful in the Panhandle, will be one of the biggest things toward lowering the lifting cost in that field because outside of the wells that are flowing by spray the major portion of all the production is recovered by swabbing. Swabbing costs will probably run from $50 to $100 a day and will be extremely hard to conduct in cold weather, and in addition to that some of those wells are drilled very close to bottom water and on producing wells it is hard with a swab to keep from starting the water. As this water comes in it will gradually exclude the oil because it has an easier path through the sands than the oil and the swab will continue to form more water at the sacrifice of the oil.

In the wells that have been making some water on a swab, when we put them on the gas lift, we found the water disappeared entirely and we have made about the same production with the gas lift as we did with

swabbing. We did not increase it, because we felt we were getting every bit of the oil out with the swabs that the well would make.

An important consideration is in keeping down the gas factor. The production rate from the well should be maintained at the rate at which the oil can approach the well. If this rate is exceeded by swabbing or fast pumping it will gradually cut down the production, which is almost the reverse action of water. If the gas is allowed to expand and come down and give a much larger gas factor, the gas is taken out of it at a greater rate than it would if the well was slowed up a little bit.

One other factor that is going to help keep up the production in that territory is electrification. At the present time there is being installed in the center of that pool a large steam turbine electric plant to supply power to the entire area and another high tension line running out from Amarillo, and most of the major companies at the present are electrifying the field and will be ready to go on electric power both for drilling and pumping probably between the middle and the latter part of next month. This should keep up the production over the winter months much better than the use of steam on account of low temperatures that will be encountered.