Savings Through Temperature Control in Oil Treating

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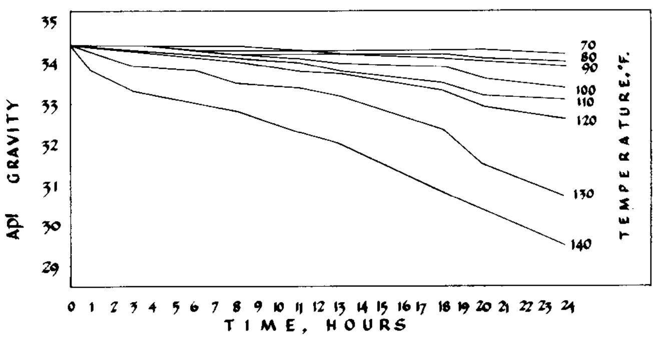


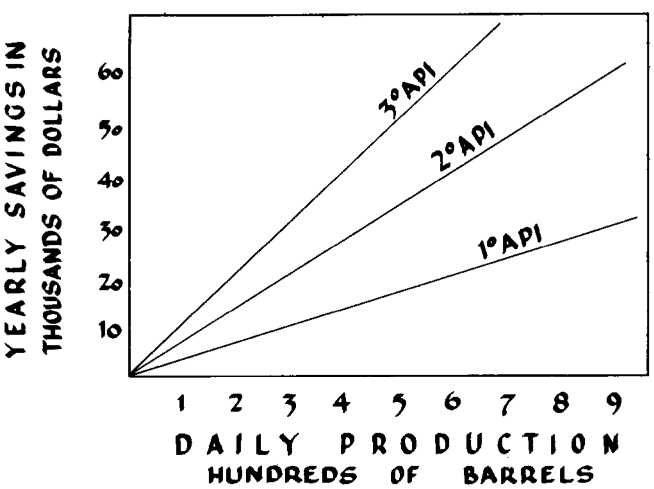
Figure 1. Gravity Loss Studies For Oil From Tubbs Formation (Study by U. J. Brammer & Sons, Inc., and Wolf Petro Lab, Inc., Odessa, Tex.)

The use of excessive temperatures in oil treating prevents the producer from realizing the full economic value of the reservoir. Furthermore, in addition to the lessening of market value of the produced oil through API gravity loss and volume reduction, corrosion and scaling processes in the heating vessel are accelerated by extraneous heating. Paraffin accumulation in storage tanks can sometimes be directly attributed to cracking off of lower boiling hydrocarbon fractions by use of excessive heat, thereby leaving the heavier residue. In such a case, a good portion of the paraffin may be soluble in the lighter fractions that evolved as vapors in the heating vessel or storage tank.

Vaporization takes place by molecular movement: the molecules of the hydrocarbon, being very active, leave the liquid and occupy the space above it. And with an increase in temperature, the activity of the molecules is increased. For example, during the winter, gravity, on various leases, increases over the summer gravity as a result of increased vapors escaping, because of daytime heat, from storage tanks.

Thus, getting a stable liquid to the stock tanks is of prime importance. In the case of a flow treater, in which treating is done under pressure and with optimum treating temperatures and in which the liquid, before going to stock, is cooled through a heat exchanger, the oil should be relatively stable. If the oil passed to storage while still hot, the vapors would escape from the storage tanks until a combination of gradual cooling and of evaporating of light ends would bring about a vapor pressure of the liquid, at the prevailing temperature, equal to atmospheric pressure. A state of equilibrium is attained when the number molecules of hydrocarbon leaving the liquid phase is equal to the number molecules re-entering the liquid phase.

Fig. 1 shows the results of gravity loss studies made by U. J. Brammer & Sons, Inc. and Wolf Petro Laboratory, Inc., both of Odessa, Texas. The laboratory studies were made under controlled pressure and temperature conditions and with a given oil. This graph on oil from the Tubbs Formation is interesting concerning the accelerated API gravity loss when the heated oil temperature exceeds 120° F.



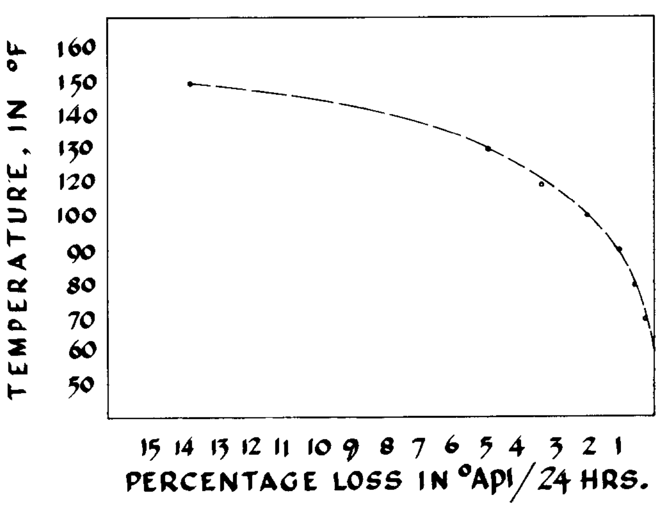


Fig. 2 is a curve based on per cent API gravity loss after 24 hr heating at the various temperatures as per Fig. 1.

Fig. 3 is a chart showing dollar loss because of gravity and volume reduction of crude oil. However, savings may be accomplished by utilizing gravity saving equipment and practices in handling lease production. This graph is based on the fact that most oil is bought on a gravity basis and on the assumption that for every degree increase in API gravity, a premium of two cents per barrel is paid. Also, on an average, every degree increase in gravity results in a saving of 2 1/2 per cent in volume at $2.50 per barrel for oil. For example, West Texas sour crude 25° API gravity sells for $2.50 per barrel and is graduated upward 3 cents per barrel for each degree increase in API gravity up to 40°. On the other hand, West Texas intermediate crude 20° API gravity markets at $2.61 per barrel and is graduated upward 2 cents per barrel for each degree increase in API gravity up to 40°. Thus because most of the oil produced in this area sells for more than $2.50 per barrel, the savings to be realized by most operators in this area are in excess of savings reflected by the chart.

If the emulsion produced is of such nature to require both heat and demulsification chemicals, an efficient demulsifier should be selected by bottle tests and plant testing. The treating system should be in good working order, relatively free of scale and solids. After establishing an optimum chemical-emulsion ratio to obtain saleable oil, the treating temperature should be reduced to a point that one no longer gets saleable oil. The heat should then be increased until the oil obtained meets buyer specifications. A safety margin of 5°-10° F. in excess of lowest temperature-saleable oil should afford continued sales of lease production.

In addition to volume and gravity losses, savings can also be effected by reducing operation and maintenance costs through prudent temperature use.

REFERENCE

1. University of Texas Petroleum Extension Service, Vapor and Gravity Control in Crude Oil Production, February, 1956.