SOME CHARACTERISTICS OF THE PRE-PENNSYLVANIAN DETRITAL ZONE IN THE OKLAHOMA CITY FIELD

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INTRODUCTION

The detrital zone in the Oklahoma City Field is found at a depth of about 6,150 feet and ranges in thickness from 0 to 373+ feet dependent upon position on the structure and locally upon the topography of the underlying beds.

It is apparent to the authors that the Oklahoma City structure is of the "buried hill" type and that its pre-detrital surface was quite irregular no doubt from both folding with possibly some faulting and from erosion.

It is known that in the vicinity of the Oklahoma City field the regular Arbuckle Mountain section of Hunton, Sylvan, Viola, Simpson, and Arbuckle formations exist below the Pennsylvanian. On top of the Oklahoma City structure the Pennsylvanian rests uncomformably on the Arbuckle limestone.

With these facts in mind the detrital material on the Oklahoma City structure might be expected to contain detritus from any or all these formations and to "fill in " any irregularities on top of the pre-detrital surface,

however, the greater part of the detritus seems to be of Simpson derivation. But this is not always the case for detritus from other formations is known also. (I. T. I. O. No. 3 Johnson SE¼ SE¼ NW¼ sec. 25, T. 11 N., R. 3 W., shows fragments of Arbuckle dolomite disseminated through the green detrital shale).

The rotary method of drilling is used almost exclusively in the Oklahoma City field and in general the study of this detrital zone has had to be made from rotary cuttings that were far from being free from cavings. A shale section of some 800 feet is drilled just above the detrital zone which caves badly and makes a careful study of conditions quite hard. However, most wells having the detrital zone have taken some cores and some have cored almost the entire section (notably Coline Oil Co. No. 1 and No. 3 Olds NW¼ sec. 24, T. 11 N., R. 3 W., both of which stopped in the detrital zone).

Physical Properties and Characteristics

The detrital zone is made up of sands, green shales, and green sandy shales with dolomitic cement. The whole zone has an abundance of pyrite. In general the cementing is poor permitting of good porosity in the sands but in some instances it is very tightly cemented with porosity quite low.

The sands are generally quite pure but poorly sorted. They range in thickness from a few inches to several feet and are probably lenticular in character. (I. T. I. O. No. 1 Johnson NE¼ NE¼ NW¼ sec. 25, T. 11 N., R. 3 W., had 40 feet of pure sand while the north offset had none). Some individual quartz grains are quite large, well rounded, frosted, and pitted while some are small and angular. Some grains have sharp edges dary enlargements on the grains. Conodants and conodant fragments of probable lower Ordivician age are quite common. Other small fossil fragments which seem cherty and give a weathered appearance almost always have had the sharp edges worn away and appear rounded and smooth.

There are some almost pure shales usually green in color but generally the shales contain disseminated lime fragments and sand grains of irregular size rounded and frosted. These shales are always very thin and no doubt are lenticular.

By far the greater part of the section is made up of sandy shales, parts of which are very dolomitic. This sandy shale is in reality a hetrogenous mass of sand and shale fragments with many large well rounded sand grains disseminated throughout.

The laminations in individual shale fragments are often at various angles to laminations in other shale fragments in the same mass. They have the appearance of a shale and sandy shale conglomerate. One shale fragment in this conglomeration was found containing a portion of a fossil *in situ*—the whole having been redeposited without disintegration.

One very noticeable fact about the whole detrital zone is that there are no apparent bedding planes to be found and especially is this true of the sandy shale portions. The authors do not believe it possible to correlate the individual sands found in various wells in the detrital zone nor any part of the detrital section with other wells in the field—this is true even

with offset wells. For example offset wells around the SW corner of sec. 24, T. 11 N. R. 3 W., and N. E. cor. sec. 26, T. 11 N., R. 3 W., bear no strategraphic similarity one to the other nor to other wells in the field in the detrital zone.

Receding from the top of the structure the detrital zone will no doubt be found to be in contact with Arbuckle, Simpson, and Viola and possibly Sylvan and Hunton. (To date it is known to be in contact with Arbuckle and Simpson). Where the Simpson lime is present there seems to be no unconformity at its base but there is a distinct lithologic change from Simpson to Arbuckle.

Age

The age of the detrital zone is very hard to place since no fossils were found that seem to represent the age of deposition; the few that were found seem to be certainly of Ordivician age and to have been redeposited with the detritus and as a part of it.

We do not find evidence of Hunton, Sylvan, or Viola materials in the zone, hence it may be questionable that those formations were ever over the top of the fold. However, their absence may be due to a lack of resistant constituents. If they were not deposited the age range would be from Simpson to Cherokee. But if they have been present and were removed by erosion the age range would be from Hunton to Cherokee.

In either case it is thought that the fold never stood as a very high land mass since little or no coarse material has been found in the detrital zone and the sediments seem to have been subjected to a long period of erosion and slow deposition with never much structural relief. The authors do not believe the detrital zone to be of Tyner age for there is a very distinct dissimilarity to the known tyner section in the area, shown by T. B. Slick No. 1 Martin, cen. N. E.¼ N. E.¼ sec. 13, T. 13 N., R. 1 W., whichhadseveral typically maroon Tyner shales in the section above the Arbuckle lime. No maroon or red shales have been reported in the detrital zone on the Oklahoma City structure.

Economic Value

High on the structure the detrital zone has yielded some very large gas wells, rich in gasoline content. Notable among these, I. T. I. O. Co. No. 1 Watters in N. E. ¼ sec. 25, T. 11 N., R. 3 W., was gaged at over 100 million cubic feet and produced some 3,000 barrels of gasoline per day.

Somewhat lower structurally some very good oil wells have been found in the detrital zone, one of these being I. T. I. O. Co. No. 2 Tropser in S. W. ¼ sec. 13, T. 11 N., R. 3 W., which made 19,722 barrels of oil in 24 hours.

Conclusion

That the so called detrital zone in the Oklahoma City field is certainly made up of local detritus and that its deposition took place near and on an old land mass seems apparent as shown by its stratigraphic and structural positions, and the nature and character of the sediments.