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Production patterns in Eagle Ford Shale (Decline Curve Analysis)

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In the last 5 years, the Eagle Ford Shale (EFS) play has had a remarkable development in natural gas and oil production. EFS covers an area of approximately 21,000 km2in South Texas. In 2010, EFS produced 139 billion cubic feet (bcf) of natural gas and 8,049 thousand barrels of oil. Up to 2020, it is expected that natural gas production in EFS will increase at a rate of 26.2% annually and oil production will have an annual production increase of 33.9%. Success in developing this play depends on an accurate approach and understanding of the reservoir, the adequate use of technology and production processes (hydraulic fracturing and horizontal drilling) and a better approach of production profiles and declination rates observed in this particular area.

EFS formation is part of the Smackover-Austin-Eagle Ford Total Petroleum System. It was formed during the Upper Cretaceous (Turonian) geologic period and presents different behaviors within depth burial, geothermal gradient, lithology and organic matter composition. EFS rests between the Austin Chalk and Buda Lime. EFS is distinguished for having total organic carbon components ≥4%, calcite, clay quartz and pyrite as part of its main mineral components. The Carrizo-Wilcox aquifer is also located within this area which extends from Rio Grande into Arkansas and Louisiana. This aquifer represents a potential water source to develop EFS play.

USGS reports that EFS has an assessment of undiscovered oil and gas resources of more than 23,000 billion cubic feet. To exploit these resources, it is important to understand which are the production profiles and reservoir depletion schemes in this play. Shale producing potential goes beyond the U.S borders; areas like Northern Mexico are looking forward to develop gas projects in similar geologic formations. Despite its development, EFS imposed diverse challenges to understand and characterize local areas to develop shale gas activities. Appropriate and sustainable development of ESF will require a good workflow from the industry, an adequate coordination of federal and local authorities and the involvement of other potential stakeholders as well.

This paper intends to give an insight into the important aspects of EFS formation: EFS reservoir characterization and point out the production pattern of unconventional sources of hydrocarbons. To achieve this goal, the paper is organized in four sections. The first section analyzes the increased importance of shale gas within the natural gas market and identifies the main shale basins in the country. The second section, considers the geological aspects of EFS. The third section describes the production methods commonly used to exploit unconventional fossil fuels. The fourth section describes the main aspects of the Decline Curve Analysis and Modeling, Finally, it discusses some of the initial findings. One of the main conclusions in this study considers hyperbolic decline curves as the best “fits” to make a quick forecast about the current production patterns in EFS and these models offer crucial information to address a proper evaluation of an EFS project.

Keywords: Decline Curve Analysis, Eagle Ford