ABSTRACT

After an operator discovered a new Baturaja reservoir, we were asked to help with a reservoir development plan including the estimation of the primary, secondary, and enhanced oil recovery potential. In addition, we were asked to develop a reservoir-monitoring program to ensure the success of the development project. Because of many uncertainties with the new discovery, we reviewed the historical results of other Baturaja reservoirs to help guide our plan. This paper should be of interest to petroleum engineers and geologists involved in waterflood development and operations for Baturaja and other carbonate reservoirs.

The primary objectives of this paper is to summarize the lessons learned from the major Baturaja waterfloods conducted in Indonesia in the last thirty years. At present, 5 major waterfloods have been conducted with 3 of them still ongoing. These projects are located in South Sumatra and Offshore Java. Based upon published results, the expected recoveries from waterflooding range from 19 to 43 %OOIP, and unfortunately, 40% of the previous projects have had poor results.

Consulting companies and other service providers have had the unique opportunity of working on various aspects in all of the fields. As such, they are able to evaluate best practices while comparing and contrasting the lessons learned.

Another aspect of this paper is a suggestion to the industry to do more to document its successes and failures so that the industry as a whole benefits. More published information will help reduce risks on any future Baturaja reservoir developments and help set the stage for other enhanced oil recovery projects, which will be increasingly important in Indonesia’s mature oil fields.

INTRODUCTION

This paper started with a request to assess the primary, secondary, and enhanced oil recovery of a new Baturaja carbonate reservoir, and to develop a reservoir-monitoring program to ensure the success of the project. Unfortunately as is usually the case, there were less reservoir data available than needed to make an accurate assessment and no obvious analogies for the field. In a quick review of the literature and our internal studies, we found 5 water injection projects in Baturaja carbonate reservoirs and several more with strong natural water-drive. Unfortunately, we found that the literature contained less information than was needed, but by combining the experiences from all of the resources; it was possible to develop a better understanding of the possible results from a Baturaja waterflood.

The purpose of this paper is to review the waterflood performance of the Baturaja formation located in five separate fields in Indonesia as shown in Figure 1. These five fields include Krisna and Rama (located offshore Java), and Jene, Kaji-Semoga (discussed as one field), and Sopa fields (located onshore Sumatra). The purpose of the review is to summarize lessons learned in the industry’s experience with waterfloods in the Baturaja formation. This review is predominantly a reservoir engineering review, but a similar or more detailed review on the geological differences and similarities would also be useful if made in the future.

Because of the lack of published information on all five fields, the paper has been separated into two major portions. The first part will review and summarize the information that has been made publicly available. The second part will be more