ABSTRACT

A QUALITATIVE NUMERICAL SIMULATION STUDY
OF CYCLIC STEAMING HEAVY OIL RESERVOIRS

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In Trinidad, several of our crude oil reservoirs are produced by cyclic steam injection. In this thesis, a qualitative numerical simulation study was used to determine the relative importance of selected reservoir and operating parameters on the cyclic steaming process, to develop guidelines for selecting candidate reservoirs for cyclic steam injection, and to develop guidelines for designing and operating local steam projects.

This study was conducted using the commercially available thermal simulator - ISCOM, which was developed by the Computer Modeling Group (CMG) of Canada.

The results of the simulation exercise indicated that horizontal permeability, formation compressibility, critical water saturation at elevated temperatures, slug size, bottomhole flowing pressure and steam quality, significantly affect production performance. With the exception of bottomhole flowing pressure, the above mentioned parameters

all gave rise to improved production performance as they were increased.

The study indicated that conventional geometric/radial spacing should not be used in the simulation of cyclic steam stimulation. Linear or equal volume spacing should be used.

Also, in the operation of thermal projects, steam quality and injection rates should be kept as high as possible, bottomhole pressures as low as possible, and successive slug sizes should be increased.

These findings would serve to improve the performance of ongoing thermal projects and assist in the selection, design and operation of future cyclic steaming projects. The findings of this study would also serve as a foundation for further numerical studies on our local steam projects.