Chapter 23

REFINERY-WIDE OPTIMIZATION WITH RIGOROUS MODELS

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1. INTRODUCTION

One reason for writing this chapter is to report the success of real-time, online refinery-wide optimization (RWO) at Suncor-Sarnia using rigorous process models. Another reason is to show how the same rigorous models can be used offline to quantify key non-linear relationships during the evaluation of project ideas, especially those related to the production of clean fuels.

2. OVERVIEW OF SUNCOR

Suncor operates a 70,000 barrels-per-day refinery at Sarnia, Ontario, Canada. The refinery processes feeds from the following sources:

– Synthetic crude oil from Suncor’s oils sands processing plant at Fort McMurray, Alberta, Canada
– Conventional crude oil
– Condensate
– VGO from a nearby refinery

Figure 1 shows an outline of the plant, which started up in 1953. Synthetic crude and conventional crude oil come to the refinery through the Interprovincial Pipeline, which runs from Edmonton, Alberta to Sarnia,
Ontario. The transit time is about one month. Other crudes are also available from nearby facilities.

The refinery includes the following major process units:
- Crude distillation (CDU) — 2 units
- Vacuum distillation (VDU)
- Houdriflow catalytic cracking unit (HCC)
- Catalytic reforming (CRU) — 2 units
- Alkylation unit
- Aromatics recovery unit (BTX)
- Unsaturated gas plant
- Saturated gas plant
- Naphtha hydrotreater
- Diesel / gas oil hydrotreater
- Hydrocracker complex