

An MILP Model for Scheduling Oil Tankers for Offloading Operations with Variable Travel Time

Leonardo Salsano de Assis

Departamento de Automação e Sistemas,
Universidade Federal de Santa Catarina, SC 88040-900 Brasil
leosassis@gmail.com

Eduardo Camponogara

Departamento de Automação e Sistemas,
Universidade Federal de Santa Catarina, SC 88040-900 Brasil
camponogara@ufsc.br

Agustinho Plucenio

Departamento de Automação e Sistemas,
Universidade Federal de Santa Catarina, SC 88040-900 Brasil
agplucenio@gmail.com

ABSTRACT

The logistics of operating oil fields off the coast entails transferring oil that accumulates in Floating Production Storage and Offloading Units (FPSOs), or floating platforms, to an onshore terminal. A fleet of Dynamically Positioned Tankers (DPTs), or shuttle tankers, is deployed for transferring oil from the floating platforms to onshore terminals, where the oil is transported in large tanker ships or by pipelines to refineries. The scheduling of a fleet of shuttle tankers that minimizes the operating costs while satisfying the system constraints consists of a complex problem. To this end, this work proposes a formulation in Mixed-Integer Linear Programming (MILP) that advances previous works by accounting for variable travel time between floating platforms and the onshore terminal. The trips of the shuttle tankers are modeled as paths in a directed graph having the onshore terminal, floating platforms, and control points as nodes and the arcs representing possible moves and offloading/uploading operations for the shuttle tankers. As a business case, the fleet of shuttle tankers should be scheduled to maximize oil production from the floating platforms while factoring in the transportation costs. The combination of the MILP formulation with an optimization solver constitutes a tool to aid operations engineers in making advised decisions. This formulation can be systematically solved daily in a rolling horizon framework to respond to unanticipated events.

KEYWORDS. Shuttle Tanker Scheduling. Rolling Horizon. MILP.

Main Area: (P&G - PO na Área de Petróleo e Gás)