Decision support in hierarchical planning systems: The case of procurement planning in oil refining industries

In this paper, we discuss the development of decision support systems for hierarchically structured planning approaches, such as commercially available advanced planning systems. We develop a framework to show how such a decision support system can be designed with the existing organization in mind, and how a decision process and corresponding software can be developed from this basis. Building on well-known hierarchical planning concepts, we include the typical anticipation mechanisms used in such systems to be able to decompose planning problems, both from the perspective of the planning problem and from the perspective of the organizational aspects involved. To exemplify and develop our framework, we use a case study of crude oil procurement planning in the refining industry. The results of the case study indicate an improved organizational embedding of the DSS, leading to significant savings in terms of planning efforts and procurement costs. In general, our framework aims to support the continuous improvement of advanced planning systems, increasing planning quality in complex supply chain settings.

General information
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Technical University of Denmark, Technische Universität München
Contributors: Kallestrup, K. B., Lynga, L. H., Akkerman, R., Oddsdottir, T. A.
Number of pages: 15
Pages: 49-63
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Decision Support Systems
Volume: 68
ISSN (Print): 0167-9236
Ratings:
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.32 SJR 2.535 SNIP 2.692
Web of Science (2014): Impact factor 2.313
Web of Science (2014): Indexed yes
Original language: English
Keywords: Advanced planning systems, Crude oil operations, Hierarchical planning, Procurement planning, Artificial intelligence, Crude oil, Hierarchical systems, Oil shale, Petroleum refining, Refining, Supply chains, Advanced planning system, Complex supply chain, Continuous improvements, Oil-refining industry, Organizational aspects, Procurement costs, Decision support systems
DOIs:
10.1016/j.dss.2014.09.003
Source: FindIt
Source-ID: 271191807
Research output: Contribution to journal › Journal article – Annual report year: 2014 › Research › peer-review

Procurement planning in oil refining industries considering blending operations

This paper addresses procurement planning in oil refining, which has until now only had limited attention in the literature. We introduce a mixed integer nonlinear programming (MINLP) model and develop a novel two-stage solution approach, which aims at computational efficiency while addressing the problems due to discrepancies between a non-linear and a linearized formulation. The proposed model covers realistic settings by allowing the blending of crude oil in storage tanks,
by modeling storage tanks and relevant processing units individually, and by handling more crude oil types and quality parameters than in previous literature. The developed approach is tested using historical data from Statoil A/S as well as through a comprehensive numerical analysis. The approach generates a feasible procurement plan within acceptable computation time, is able to quickly adjust an existing plan to take advantage of individual procurement opportunities, and can be used within a rolling time horizon scheme. © 2013 Elsevier Ltd.

**General information**
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Technische Universität München
Contributors: Oddsdottir, T. A., Grunow, M., Akkerman, R.
Pages: 1-13
Publication date: 2013
Peer-reviewed: Yes

**Publication information**
Journal: Computers and Chemical Engineering
Volume: 58
ISSN (Print): 0098-1354
Ratings:
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.06 SJR 1.287 SNIP 1.808
Web of Science (2013): Impact factor 2.452
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Original language: English
Keywords: Blending, Crude oil, Decision support systems, Digital storage, Nonlinear programming, Refining, Tanks (containers), Petroleum refining, Procurement planning, Oil refining industry, Mixed integer non-linear programming, Solution approach, Crude oil scheduling, Decision support
DOI:
10.1016/j.compchemeng.2013.05.006
Source: dtu
Source-ID: n:oai:DTIC-ART:compendex/389718366::30584
Research output: Contribution to journal › Journal article – Annual report year: 2013 › Research › peer-review

**Procurement planning under uncertainty for oil refinery operations**

**General information**
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management
Contributors: Oddsdottir, T. A., Akkerman, R., Grunow, M.
Number of pages: 10
Pages: RIS7
Publication date: 2012

**Host publication information**
Title of host publication: Proceedings of the 4th World Production and Operations Management Conference
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2012 › Research › peer-review