Summary

BP Raffinaderij Rotterdam (BPRR) has proposed a research project, which is called the 'WAX hub Project'. 'WAX' is one of the products that are produced at BPRR and is categorized as a Fuel Oil (FO). 'Hub' means, that there is a trading facility located at the refinery for a certain product.

In this report, it is investigated whether it is possible that BPRR can free up Fuel Oil tanks for the WAX hub, without affecting the daily operations, or build a new tank.

BPRR's main function is 'adding value' to oil. The Black box approach is used for BPRR to create a process model. The process model of BPRR has the following functions: import, distill, upgrade, blend and export oil.

- about 22.4 million ton is imported yearly
- about 18 million ton is distilled at the CDU area yearly
- about 4.9 million ton is upgraded at the FCCU area yearly
- about 6.8 million ton is created yearly by blending
- about 22.4 million ton is exported yearly

In between, the oil can be stored at Oil Movement, the tank farm of BPRR. In total, BPRR has a storage capacity of 3.3 million m3.

A simulation model is made during the WAX hub project: the Fuel Oil Simulation model (FOSIM). FOSIM allows the user to define the following input parameters:

- Flow values
- Barge and vessel input parameters
- Jetty properties
- Product properties
- Tank properties
- Miscellaneous parameters

Which products can be placed in which tanks can also be defined.

The behavior of FOSIM is based on a 'trigger' concept. Every tank has a physical minimum and maximum: minDip and maxDip. Also, lots of tanks have a 2 days safety stock. These levels are indicated with minOps and maxOps. Depending on the reaction time, the trigger levels are even somewhat tighter than minOps and MaxOps. These levels are called minTrig and MaxTrig. The processes that are active in FOSIM are described in Process Describtion Language: PDL.

FOSIM generates the following output data:

- Tank level patterns
- Flow values
- Jetty occupancy
- Miscellaneous parameters

FOSIM was validated. After that, 6 cases were run with FOSIM.

- Case 1 : base case: the best 3 tanks were selected for the WAX hub: tank 123, 156 and 34.
- Case 2 : use tank 123 as WAX hub
- Case 3 : use tank 156 as WAX hub
- Case 4 : use tank 34 as WAX hub
- Case 5 : use new tanks as WAX hub of 15 km3
- Case 6 : use new tanks as WAX hub of 30 km3

After that, during an operational and economical analysis the following conclusions were drawn:

- For using existing tanks:
  The increase in daily operation interventions (=additional oil moves because of the WAX hub for the product that was originally in that tank) is:
  - when using tank 123 : 10%
  - when using tank 156 : 0%
  - when using tank 34 : 5%

- For using new tanks:
  - The simulated tank level profile of a 15 km3 HS WAX TRADE tank is realistic.
  - The simulated tank level profile of a 30 km3 LS WAX TRADE tank is realistic.

A small tank (15 km3) is economical justified when the throughput is 150 kt/yr, a large tank (30 km3) is justified when the throughput is 300 kt/yr.

WAX (TRADE), which is the description of WAX that is stored in the WAX hub, has the following throughput during the simulation:

- LS (low sulphur) WAX (TRADE) : 207 kt/yr
- HS (high sulphur)WAX (TRADE) : 63 kt/yr

So when a new tank is considered, only a 15 km3 tank for LS WAX (TRADE) is justified. But 15 km3 was regarded infeasible for LS WAX (TRADE). So a new tank would not be economical attractive, unless the throughput is increased (additional imports/exports).

The cases that were run with FOSIM and the operational analysis show that it is indeed possible to free up two tanks. So no new tank has to be build. The economical analysis didn't justify a new tank anyway, unless the WAX production was increased. The two best tanks are:

Tank nr	Current product	Volume [m3]
123	HS VISRES	46,000
156	HS ATRES (VDU FEED)	46,000

Because the tanks have equal volumes, LS and HS WAX (TRADE) is random divided:

Tank nr	New product	Volume [m3]
123	LS WAX (TRADE)	46,000
156	HS WAX (TRADE)	46,000