



# Performance Forecasting – Downstream Industry

## Optimising Asset design and operations

DNV is a leading independent provider of consultancy services related to reliability analysis and performance forecasting in the upstream and downstream industries. In the downstream industry our consultancy services range from plant wide performance analysis to distribution network studies, supply chain models, life cycle cost analysis down to detailed reliability engineering and failure investigation.

Over the last ten years DNV has developed a unique methodology to forecast the performance of complex assets in the downstream industry. This methodology can be applied to refineries, petrochemical plants, production and distribution networks, etc.

### Approach

To forecast the performances of a complex asset, the interactions of a large number of factors, that impact on the ability of the system to perform its required function, must be assessed in an integrated manner. The key challenge is to capture all the interactions between inter-related parameters.

To perform this complex task DNV use a dynamic simulation software package, “*TARO Refining*” (developed by Jardine Technology), that enables a quantitative picture of performance to be built up from equipment reliability, to unit reliability, to unit utilisation, to production efficiency.

### Example: Refinery Analysis

A typical refinery analysis encompasses the interactions between the process units, the storage tanks, the market

constraints and the operational issues. In particular the model will take into account the equipment/unit reliability, the maintenance strategies, yields and material balance, storage and inventory management, impact of utilities systems and support units, operational flexibilities, alternative product routings, and any external system constraints (e.g. feed/export limitations). Through the definitions of all these rules and parameters it will be possible to simulate the real life asset operations.

The analysis results are primarily focused on:

- Achieved production efficiencies for the key product streams, production trends.
- Units utilization and overall refinery utilization.
- Tanks utilization, average level, top ups, bottom outs, etc.

The prediction of the system performance is not usually the final objective of the study. Initially the analysis focuses on the identification of bottlenecks and key performances drivers. Once these are known, it is possible to optimise the system performance by analysing the effects of changes to a range of parameters (sensitivity analysis).

The quantification of expected performances is a key step in the design optimisation process. Often the study will also assess the impact on the system performances of revamp projects or of a range of different investment/divestment opportunities. The results will be used to quantify costs and benefits and to rank these opportunities based on their potential return.

### **Example: Production and Distribution Network**

A typical network analysis (e.g. a distribution system) will include all interactions between suppliers (e.g. refineries), intermediate processing plant (e.g. petrochemical plants) and customers; taking into account all transportation methods, alternatives feed supplies, alternative product dispositions, variation in products demand, impact of reliability on the production and transportations of the intermediate and final products, storages tanks, etc.

The analysis results are primarily focused on:

- Product supply efficiencies.
- Demand Shortfall analysis.
- Probability of meeting customer demands.
- Optimization of the products distribution and transportation.

### **Benefits**

The objectives and benefits of this type of analysis depend on the type of asset being analysed: We have successfully applied this methodology to both new and existing plants. Typical objectives are:

- Asset Design Optimisation (e.g. storage tanks, units capacity, equipment sparing, etc).
- Asset Operations Optimisation (e.g. maintenance philosophy, inventory management, product export, load shedding rules, etc).

- Identification of bottlenecks and key performance drivers (e.g. relation between asset reliability and production).
- Setting of performance targets (e.g. where to focus reliability improvement efforts).
- Evaluation and prioritisation of investment opportunities (based on NPV calculation of costs and revenues).

The Performance Forecasting methodology and the dynamic simulation technique ensure that all the factors that can potentially influence the production are considered in the analysis so that a more realistic picture of the future asset performance is produced.

Some of the typical benefits that can be achieved are:

- Maximise production of key products.
- Improvement of plant utilization.
- Minimisation of investment required to achieve given targets.
- Optimisation of storage requirements.
- Quantification of the impact of project implementation.

We work together with clients to ensure that the developed simulation models also incorporate the client's personnel understanding of the asset and the way it operates within their organization. Each asset and operator typically have their own specific issues, so the use of an across-the-board standard solution is often not advisable.

### **Additional DNV Consulting Services Include:**

Enterprise Risk Management, Management, Consultancy, Asset Management, Technology Services, Health and Safety Assessment, Corporate Reporting, Report Verification and Certification Services, Due Diligence Services.