Increasing Value of Capital Projects: 

*Through a combination of convergence and divergence*

European Value Management Conference 
Brighton, UK

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Slideshow Storyline

- Introduction
  - Shell, Project Environment, Market Environment
- Project Governance
- Design Class: Theory & Application
- Value Engineering: Theory & Application
- Assurance Availability Modelling : Theory & Application
- An example
- Conclusion / Recommendation
- Questions & Answers
Royal Dutch Shell

112,000 employees
over 140 countries

Exploration & Production
Gas & Power
Oil Products
Chemicals
Renewables
Royal Dutch Shell – The Project Environment

- Over 1,400 Project Engineering Professionals

Athabasca Oil Sands

Sakhalin II
Project Governance

- **Stage Gate Process**

- **Mandated Deliverables per Project Phase**
- **Structured Assurance Reviews**
- **Series of Value Improving Practices**
Project Governance: Project Value Processes

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<th>Project Value Processes</th>
<th>Primary Application of Mandated Processes</th>
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<td>1) Building the Project Team</td>
<td>Identify: 1</td>
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<td>2) Opportunity Framing &amp; Project Goal Setting</td>
<td>Identify: 2</td>
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<td>3) Contracting and Procurement Strategy Development</td>
<td>Identify: 3</td>
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<td>5) External Benchmarking</td>
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<td>7) Project Assurance</td>
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<td>8) Value Engineering</td>
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<td>10) Constructability</td>
<td>Identify: 10</td>
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<td>12) Availability Assurance / Reliability Modelling</td>
<td>Identify: 12</td>
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- **Mandatory Process**
- **Recommended Process**

Design Class
Value Engineering
Assurance Availability & Reliability Modelling
Why Workshop format?

✓ Project external facilitation: establish team **focus**
✓ Stakeholder **alignment**
✓ Different **approach** to the opportunity
✓ **Build** on each other’s expertise
The workshops: Before, during and after

Workshop preparation:

- **Agree** on workshop objectives
- **Stakeholder** analysis: Who can influence? Who will be affected? Who can challenge us?
- **Customized** format for the project
The workshops: Before, during and after

Drivers during the workshop:

- **Quality** discussions
- **Decision** driven: take the project further!
- **Action** driven
- Agree with the **way forward**: contract
The workshops: Before, during and after

After workshop:

- Outcome is considered a **contract**
- Outcome is **implemented** in project development
- Project team feedback = **improve**!
Converging Design Class

Where the wants and the needs meet the capital
Design Class: In brief...what is it?

- Structured process
- With the right stakeholders
- To discuss the performance requirements
- Of project scope breakdown
Several performance factors

Design Capacity
- Class 1
- Class 2
- Class 3

Capacity Operating Range

Capacity Utilization
- Class 1: <85%
- Class 2: 85% - 95%
- Class 3: >95%

Expandability
- Class 1: None
- Class 2: Selected Streams
- Class 3: Considered
The three classes

Class 1:
- Meets business requirements
- Minimum scope
- Without jeopardizing safety
- Lowest plant cost

Class 2:
- Class 1 plus…
- Selective upgrade for higher assurance for some off-design conditions
- Costs will be higher than Class 1 plant

Class 3:
- Class 2 plus…
- Upgrade for higher assurance for most off-design conditions
- Costs will be higher than Class 2 plant

Complexity increase

CAPEX Increase
(Class 1) 0 - 6% (Class 3)
**Design Class: focus in project phases**

**Design Class Select**

**Purpose:** align priorities and requirements of facility between business, operations, projects, engineering

**Deliverables:**
- High level facility performance contract
- List of big ticket items
- Description of how these items impact schedule & cost

**Design Class Detail**

**Purpose:***
- Align engineering requirements between project team & engineers on equipment level

**Deliverable:**
- Design and engineering criteria on equipment level

**Identify**

**Assess**

**Select**

**Define**

**Implement**
Diverging Value Engineering

Approaching the opportunity with an open mind
Value Engineering

- **Structured** process
- With the right **stakeholders**
- And expertise! **Challengers** from outside the project team.
- To discuss the hardware **requirements**
- For the **functions** the facility needs to fulfill
Value Engineering: focus in project phases

Identify

Early Identify and Assess phase

Focus:
- Improve economics
- Technology selection

Assess

Late Assess phase

Focus:
- Process simplification

Select

Define phase

Focus:
- Design Engineering
- Operations

Define

Implement
Converging Assurance Availability & Reliability Modelling

Will the project deliver on promise?
The power of the combination

Design Class

Value Engineering

What do we need? How can we optimize value?

What are the performance requirements?

AA & R Modeling

Do we get what we aim for?
A REAL CASE
Large Shell Chemicals Project in Asia

- Ethylene Cracker:
  - Part of integration between refinery and Chemicals Downstream
The Design Class outcome: Ethylene Cracker

**Design Class Select** workshop: held early Assess Phase

Value of Design Class Select:

- Alignment on high level performance
- Established the basis to equipment specification (Design Class Detailed)
The Design Class outcome: Ethylene Cracker

**Design Class Detailed**: Held in early Define Phase

Value of Design Class Detailed:

- Open detailed discussion among different disciplines
- Full detailed alignment between Shell and contractor
- Improved project continuity in knowledge on decisions made on (detailed) scope level
The Design Class outcome: Ethylene Cracker

- Capacity
- Expandability
- Capacity Utilization

Class 2
-5%  Design Capacity + 5%

Class 1
Design based on refinery capacity

Class 3
98%

The Framework

All equipment design based on this outcome
The Value Engineering outcome

Workshop with focus on **design simplification**: early Assess Phase

Workshop with focus on **engineering and operations**: early Define Phase

Value of applying the process:

- Significant costs saved
- 60% of total “idea value” was incorporated
- The incorporated ideas fit within the frame established through Design Class
- All agreed!
The Value Engineering outcome

Examples of **ACCEPTED** Value Engineering ideas:

- **Idea:** Delete dedicated steam let down station for steam export to the refinery. This system lets down SHP steam into HP, MP and LP steam.
  - **Justification:** The refinery will use system as backup once in 8 years.
  - **Saving:** $ 2000 K

- **Idea:** Delete LP refinery gas feed system (compressor + vessel + heat exchanger)
  - **Justification:** The system is only used 2 weeks every 6 years for pressurizing LP gas to the cracker furnaces
  - **Saving:** $ 4000 K
The Value Engineering outcome

Examples of **NOT ACCEPTED** Value Engineering ideas:

- **Idea:** Delete the sweet fire water pumps. Fully use Salt water in case of fire.
- **Justification:** Sweet fire water only used the first six hours, remaining time salt water is used
- **Saving:** $1300 K

**Not accepted:** Risk of Stainless steel corrosion. Increased long term maintenance costs and decreased availability of the system
The Value Engineering outcome

- Ideas only accepted if facility performance stays within predetermined framework
- Within framework sufficient room is left for alternatives
The Assurance Availability outcome

**Assurance Availability** started end Assess Phase

Outcome:

- Based on proposed (proven) configuration the calculated **Availability**: 98%
- Aligns with **Design Class** established framework
- Accepted **Value Engineering** alternatives no impact on performance
Conclusions & Recommendations
Drivers for success

- Power of the VIP tripod
- **Expertise** available during the workshop
- Right **stakeholders** involved (influence & impact related)
- Timely contractor involvement (in workshops)
- Workshops held at the **right time** in development
- **Externally facilitated**: Quality, alignment, decision driven
Questions & Answers Session
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