Implications of NORSOK M-650 Standard in the Offshore Industry
A User’s Perspective

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Programme

• What is NORSOK and the M-650 standard?
• History and development of the M-650 Standard
• Overview of NORSOK M-650 qualification process
• User Experiences
• Future: Implications for the Offshore Industry
What is NORSOK?

Norwegian Oil Industry Association

Federation of Norwegian Engineering Industries

Add Value and Reduce Cost, Lead Time, and Unnecessary Activities

Aims

Replace Individual Company Specifications Occur When International Version Not Available Withdrawn When Superseded by International Versions

NORSOK Industry Initiative for the Competitive Standing of the Norwegian Offshore Sector

Standards

M630 Material Data Sheets for Piping

M650 Qualification of Manufacturers of Special Materials

Norwegian Technology Standards Institution Administered by
What is the NORSOK M-650 Standard?

• ‘Qualification of Manufacturers of Special Materials’
  – Qualification process to determine the competency of manufacturers of special material grades to supply products for use in the Norwegian oil & gas industry

• Main qualification requirements
  – Capability, skill, and understanding to handle the required material grade
  – Adequate facilities and equipment
  – Manufacture products with acceptable material properties
  – Implemented Quality Management System
When is the standard used?

- When required by the material data sheets in NORSOK M630 – ‘Material Data Sheets for Piping’
- At discretion of the main contractor when material is ‘not special’ but the component is critical
- Special materials defined as:
  - Duplex Stainless Steels
    - All Grades, Product Forms and Dimensions
  - High Alloyed Austenitic Stainless Steels
    - All Product Forms and Dimensions
  - Nickel Base Alloys
    - Castings
  - Titanium and its Alloys
    - Castings
Where did the standard come from?

• 1980’s saw increased use of ‘special materials’ in the Norwegian offshore sector
  – Superior properties at low design temperatures
  – Suppliers manufacturing products outside their area of expertise
  – Components with unacceptable properties
  – Project delays
Sleipner West Project 1

- Pre-approval of manufacturers at bidding stage
- Aims of process:
  - Authenticate competent and reliable manufacturers
  - Eliminate manufacturers unable to meet quality requirements.
  - Avoid delivery problems
Sleipner West Project 2

• Each manufacturer:
  – Submit step by step process description and manufacturing procedures
  – Testing
    • Charpy – Micrographic - Corrosion
  – Visited to establish
    • Sufficient competence and experience
    • Adequate facilities and equipment
NORSOK M-650 Rev 1

• Formalisation of Sleipner approval process

• Requirements:
  – Sufficient understanding and experience
  – Testing in accordance with the MDS
  – Documented evidence of successful manufacture of special materials
  – Qualification allowance (general)
    • Thickness + 25%
    • Weight + 50%
NORSOK M-650 Rev 2

• Complete revision of standard
• Additional Requirements
  – Additional testing requirements (informative only)
  – Heat treatment furnace survey (ISO 10423 API 6A)
  – Quality Management System required (ISO 9001)
  – Qualification Test Record to be produced
  – Qualification allowance (general)
    • Thickness + 25%
    • Weight G + 100% Max 250kg or if G>250kg all weights
NORSOK M-650 Rev 3

- Tightens up qualification process considerably
- Additional requirements
  - Increased testing requirements (informative only)
  - All testing 3rd party witnessed (EN 10204:1991 3.1C)
  - Qualification Test Record revised
  - All qualifications valid for 5 years
  - Heat treatment furnace temperature uniformity survey (ASTM A991)
  - Qualification allowance – new restrictions
    - Thickness T + 10% below defined levels and T above them
    - Weight G + 100% below defined levels and all above them
Overview of NORSOK M-650 Process

- Manufacturing
- Visit & Inspection
- Testing
- Review & Resolution
- Certification
M-650 Process – Manufacturing

- Produced according to Manufacturing Summary
- Following company QMS and procedures

- Made by competent and trained personnel
- Evidence and document trail to back you up
M-650 Process – Visit & Inspection

• Standard requires visit by purchaser to assess:
  – Facilities and equipment
  – Quality Management System and the implementation of procedures
  – Competence, knowledge, and experience of personnel and management

• Question and answer session

• End of visit: Minutes
  • Detail facts of visit
  • Document actions required to ensure manufacturer meets qualification requirements
M-650 Process – Testing

• Split into two categories
  – Required by the MDS and must be passed in order to gain qualification
  – Required by the standard and is informative only

• Testing must be 3rd party witnessed
  – EN 10204:2004 3.1C
M-650 Process – Review and Resolution

- Resolution of outstanding problems:
  - Testing
  - Outstanding actions from visit
    - Quality Management System
    - Process procedures
- Compilation of Qualification Test Record
- Review of process and record by purchaser
M-650 Process – Certification

- **Certificate:**
  - Valid for 5 Years
  - States:
    - standard, material, product and process
    - Tested thickness and weight
    - Qualified thickness and weight
  - Carry forward qualification / approval for future work in this product and size range
Telling the world about your qualification

- NORSOK do not approve or qualify manufacturers
- NORSOK do not maintain a central registry of qualified manufacturers and do not intend to do so
- Increasing pressure to use qualified manufacturers
- Norwegian National Institute of Technology
  - Started and maintain an independent central registry
  - First QTR ~£800
  - Subsequent QTR’s ~£500
Welcome to Norsok M-650 Qualified Manufacturers Database

Using the Search key without defining any search criteria will give the complete list of qualified manufacturers.

Under “Manufacturer” the name of all qualified manufacturer will be found and search on one of them will show the complete list of qualification hold by the actual manufacturer.

Under “Type of Material” and “Type of products” you will find the materials and products as defined in M-650.

Search in database

Manufacturer: All manufacturers
Type of Material: All types
Type of Product: All types
MDS: All type

Search Clear
# List of Qualified Manufacturers

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Country</th>
<th>Web Address</th>
<th>Type of Material</th>
<th>Type of Product</th>
<th>MDS</th>
<th>Tested Thickness</th>
<th>Qualified Thickness</th>
<th>Qualified Weight</th>
<th>Date of Qualification</th>
<th>Date of Expiry</th>
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<tr>
<td>Forging Shop</td>
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<td>Forgings</td>
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Click [here](#) to download the complete datasource (Excel must be installed)

# End of List
User Experiences

• Present
  – Interest increase in run up to adoption of 3rd revision
  – Lack of pre-qualified manufacturers
  – Qualification runs parallel with production

• Two camps
  – Manufacturers and sub suppliers
  – Oil companies and main contractors
Manufacturers and sub suppliers

• Experience
  – Improvement on per project approval process
  – Qualification process confusing, cumbersome and slow
  – Qualifications come from multiple bodies with different views

• Developments
  – Would like to see:
    • Streamlined process
    • Qualification process approval managed by independent body
Oil companies and main contractors - Experience

• Replaces several company standards with best industry practice
• Extended testing explores material property variations
• Standard not taken seriously by some suppliers
  – Subsequent use of unqualified sub suppliers
• Issues with manufacturers
  – Quality assurance systems too generalised
  – Procedures not often dedicated to specific material grade
  – Too willing to accept orders outside area of expertise
  – Metallurgical knowledge lacking or dependent on one person
  – Quality heat treatment systems and operations key to minimising material property variations
Oil companies and main contractors – Developments

- Possible adoption by other national or transnational bodies of the standard
  - Aim of all NORSOK standards
- Increased requirements
  - More representative testing
  - Informative testing may become mandatory
Future: Implications for the Offshore Industry

• M-650 adoption
  – Norwegian companies operating in foreign waters are starting to use the standard
  – Rumoured non-Norwegian oil companies using the standard in other waters

• Increased demand for qualified manufacturers
  – Larger pool of qualified manufacturers
  – More certainty at bid stage of availability of competent manufacturers of special materials
  – Reduced delays at fabrication yards for contractors
Web Links

• Norwegian Standards
  – www.standard.no/petroleum

• National Institute of Technology - Norway
  – www.teknologisk.no/norsok-m650

• Geoff B Associates
  – www.geoffbassociates.com
Questions