PSAM 9

Safety standards, software and improved development of safety equipment

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Thursday 22 May 2008

Safety standards and instruments

- Cluster
- Research methods
- Directives and standards
- From description to overview of safety requirements
- EMC
- Conclusions

Safety standards and instruments

Instrumentation Cluster:

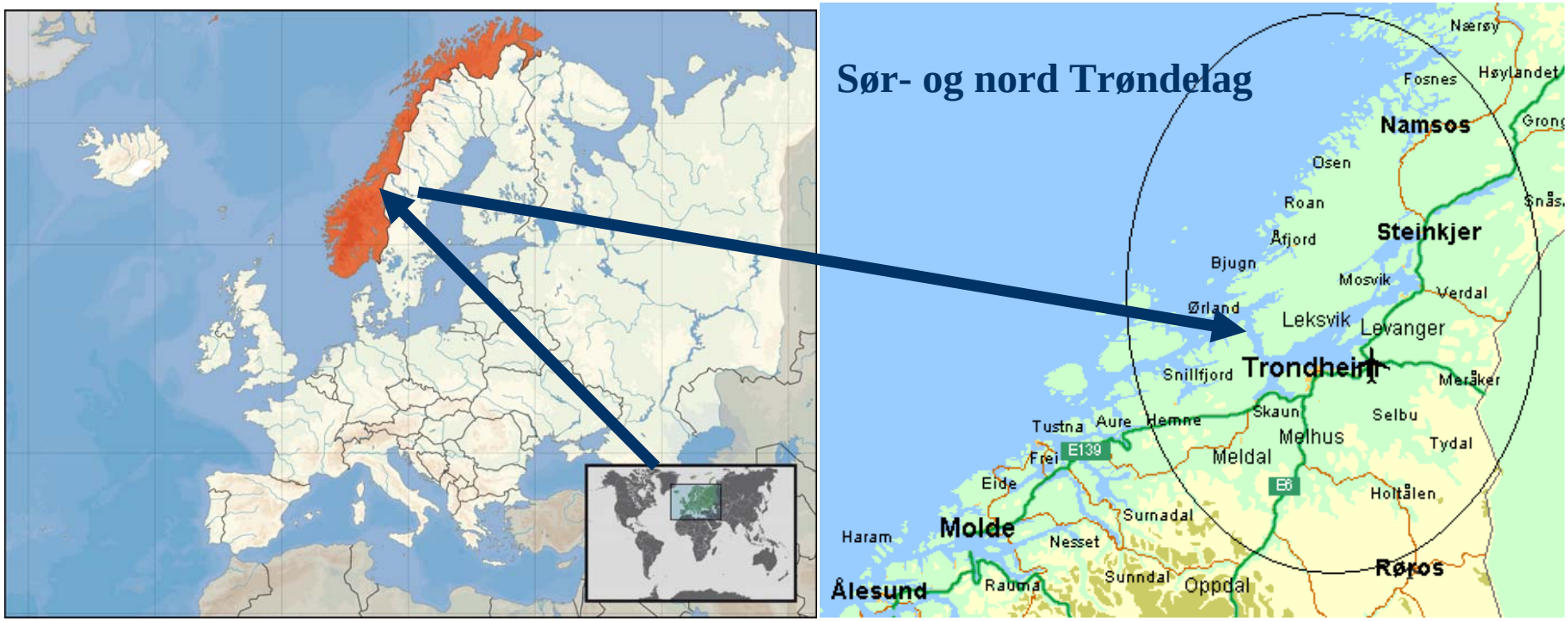
- 100 instrumentation companies
- Appointed Norwegian Centre of Expertise Instrumentation (NCEI) in April 2006
- Appointed by the
  - Ministry of local government and regional development and
  - Ministry of trade and industry
- www.ncei.no

Safety standards and instruments

The purpose of the NCEI cluster:

- Speed up the innovation process in regional companies through cooperation between
  - companies
  - researchers
  - universities and
  - public authorities

Map of Norway and Mid-Norway



Safety standards and instruments

Project background

- Standards and software development
- The software part constitutes more than 50% of the development costs.
- FOSS (free software and open source)
- Instruments fail the first time it is tested by the test lab.

Safety standards and instruments

Research methods

- Literatture survey
  - IEEE Xplore and ACM databases
  - of directives, standards and guides
  - of Annual reports from the cluster companies
- Questionnaires
- Project meetings

Safety standards and instruments

Operating revenue

- **> 20% from 2005 to 2006**

- **2006 to 2007 was also very good**

Why?

- Market
- Cluster
- Special products
- Internationally oriented and innovative

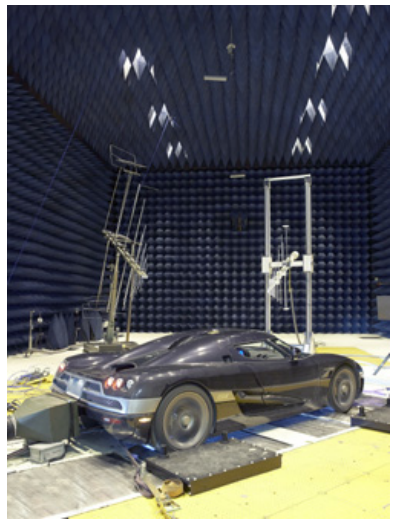
Safety standards and instruments

Directives

CE

The most important and complicated directives are:

- EMC directive
- ATEX directive



Ex

Safety standards and instruments

Process to establish safety requirements:

- Intended market
  - Regions/countries and sectors: offshore, automotive etc
- Regulations, directives and standards
- ZA part of European standards
  - Relation to directive
  - Methods for attestations of conformity
  - Declaration of conformity and CE certificate

Safety standards and instruments

Number of standards and safety requirements

- ~ 20 standards including different standards as
  - Generic standards, e.g. IEC 61508
  - Product, e.g. fire alarm systems: EN 54 series
  - Basic
    - Tests and measurements
    - Terminology, compatibility levels etc
  - Collateral
    - These standards cover subjects of interest to a range of products
- ~ 5.000 requirements

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Cost estimation, FOSS and overrun

- Freeware/FOSS products
  - CoCoMo (Constructive Cost Model)
  - Planningpoker
- Excel sheets
- Overrun > 30%

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Products fail in at least one test

- ~50 physical test

Challenging tests (rated)

1. EMC
2. Ex tests
3. Environmental/vibration tests

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How to solve the problem with test failures

1. **Focus on EMC**
2. **Managers are not aware of this problem**
3. **Requirement management (RM)**
4. **Experience and continuity**

Safety standards and instruments

1 EMC

- Less test equipment
  - No tests before the instruments are send to the test lab.
- Involve all the engineering disciplines

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1 EMC continued

- EMC requirement specification
- FMECA
- EMC control and test plan
- EMC test reports

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2 Managers are not aware of this problem

- **Do not wish to face the problem**
- **More manhours early in the project**
- **Part of national standardization strategy**

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3 Requirement management (RM)

- Poor specification was the root cause of as many as 44% of the problems
- None of the companies use tools for RM
- More functional requirements than technical requirements (more difficult to understand)

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3 Requirement management (continued)

- Interpretation of requirements in standards
  - Bad and foreign language
  - Bad translation (if translation exists)
  - Imprecise requirements
  - Non-consensus recommendations
  - Insufficient descriptions
  - Missing definitions
  - Conflicting requirements

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4 Experience and continuity

- Engineers work with the standards in short periods
- New products are seldom developed.
  - E.g. start new major development projects every two year
- Some of the engineers change job or leave the company

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Conclusion

- Operating revenue increase > 20% per year
- Still 12 years after the EMC directive came into force it is difficult to comply with the directive
- Companies have to comply with more standards
  - New regions and markets,
  - software and
  - wireless communication