Quality Management using Key Performance Indicators at MTU Aero Engines

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### MTU and its business model

<table>
<thead>
<tr>
<th>OEM business</th>
<th>MRO business</th>
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<tbody>
<tr>
<td><strong>Commercial engine business</strong></td>
<td><strong>Military engine business</strong></td>
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<tr>
<td>• Risk- and revenue-sharing partner in programs of all major OEMs</td>
<td>• Capability to develop and manufacture complete propulsion systems</td>
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<td>• Focus on low-pressure turbines and high-pressure compressors</td>
<td>• R&amp;D is frequently financed by the customer</td>
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<td>• Approx. 30% of the active engine fleet flies with MTU components on board</td>
<td>• MTU has significant stakes in the major European military programs</td>
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**GP7000**

**EJ200**

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<tr>
<th>Revenues</th>
<th>EBIT</th>
<th>Headcount</th>
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<tr>
<td>1.146 m€ (42%)</td>
<td>7537</td>
<td>7537</td>
</tr>
<tr>
<td>497 m€ (18%)</td>
<td>331 m€</td>
<td>331 m€</td>
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<tr>
<td>1.113 m€ (40%)</td>
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* FY2008
The players in the engine market

The major market players in the engine business

- OEMs
- Engine sub-system (module) providers
- Engine component suppliers

Overview of the engine industry

- Players specialize in specific engine modules and technologies
- Oligopolistic market structures
- High market entry barriers:
  - High technological expertise required
  - Substantial up-front investments required (R&D, royalty payments)
  - Long-term agreements
  - In part captive spare parts market
  - Acceptance and certification requirements and approval by authorities
The market cycles (status September 2009)

Source: MTU/ASM September 2009, Airclaims’ CASE
Remark: Western-manufactured jet powered commercial transport aircraft are considered (Airliners, Freighters & RJs; turboprops, business jets, military and general aviation excluded)
To shape our future, the MTU strategy is targeting profitable growth in all business segments

~ 6 Bn.€ Sales 2018
EBIT > 12%

Customers / Partners
Products
Branding
Shareholders
Employees
Locations

First-class technology
Successful programs
Competence enhancement in market niches
Growth via acquisitions
Competitive cost structure

Quality, Reliability, Speed, Productivity and Intercultural Expertise

Strategic target
Strategic target fields
Strategic pillars
Strategic basement
Quality, a management task

- Mindset of organization
- MTU Board follows up KPIs
- Focus on selected KPIs
- Monitor development of trends
- Quality audits and initiatives

Quality needs to be produced by every individual at any time.
Quality, a selling argument

CIP as an ongoing process throughout the complete organization

Improve price/ performance ratio

Dedicated projects to improve KPIs examples:

- strong improvement of TAT and OTD in MTU’s MRO locations
- to become benchmark
- to win new contracts on the basis of best quality
MTU's Integrated Management System (IMS)

- Safety is a prime concern in aviation.
- The smallest of mistakes may have catastrophic consequences. Therefore MTU insists on the finest quality of its products and services.

**Quality and safety are the first priority in whatever we do.**

A world-class, efficient Integrated Management System (quality, occupational health & safety, environmental protection) that ensures that principles, objectives and standards are put in place at all of the company's locations.
The key quality data / indicators have been continuously improved

- Customer complaints (components)
- Scrap costs
- Rework costs
- DPM
- RP
- Spec compliance
- Process maturity levels
- First pass yield (components/engines)
- EFQM result
- First pass yield (Design)
- Supplier performance
- Number of component mods
- Compliance with development milestones
- Passed reviews (design / production readiness)
- Statistical process control (SPC)
- Process quality Development quality

Production quality Process quality Development quality
1995 2005
MTU's system allows the key performance indicator information to be viewed from different perspectives

- Management perspective
- Center perspective
- Team perspective

A complete and consistent database for the generation of key indicators for different perspectives
Cost optimization and quality do not have to contradict each other
Aviation safety is the first priority in whatever we do!

Highest priority on customer needs
Strong focus on on-time and on-quality delivery

Implementation of best-practice processes in production and quality management
Intense oversight and training of our suppliers
Continuous improvements through people, processes and tools
Highly qualified and trained personnel
Participation in national and international initiatives and working groups to develop internationally accepted standards
"Good is not good enough where better is expected."
(Thomas Fuller – English historian)
weiteres Material
We use key performance indicators (KPIs) to continuously improve our operational performance.

1. The company's objectives are broken down into the operational units' objectives.
2. The relevant key performance indicators are consistently reported.
3. In the event of deviations, corrective actions and failure analyses are initiated without delay.
4. Our Continuous Improvement Program (CIP) supports sustained process optimization.
5. The organization's productive efficiency is improved, the objectives are adjusted.
External consultants help with the optimization of selected KPIs

Example: Project for the reduction of turnaround time (TAT) in parts manufacturing

Result: TAT reduction by 26% achieved (average out of 54 components)