Effective Implementation of the Automotive Core Tools

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• During presentations (14:00 – 14:30) everyone will be muted so that only the presenters will be heard.

• The presentation will be followed by a Q&A session. Click on the hand symbol to show that you have a question.

• If you are experiencing any technical problems please call 0207 344 1611 or 07793 773391

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Paul Hardiman, Principal- Global Best Practice

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Advanced Product Quality Planning (APQP)

CONTINUAL IMPROVEMENT

• Put in place the actions to improve

PRODUCT AND PROCESS VALIDATION

• Did things happen according to plan?

PLAN AND DEFINE

• What to do
• How to do it
• Who will do it
• By when

DO

• Do what was planned

STUDY

ACT

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The Automotive Core Tools

- Design FMEA
- Process FMEA
- Product/Process Characteristics
- Control Plan
- Measurement Systems Analysis
- Statistical Process Control
- Standard Operations
- Product approval Process (e.g. PPAP)

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How much does it cost to effectively implement the automotive core tools?

- Training cost

- Employee time to participate in:
  - FMEA Workgroups
  - Developing control plans
  - Undertaking MSA studies
  - Undertaking capability studies

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How much does it cost to NOT effectively implement the automotive core tools?

• **Cost of external failures**
  – Returns
  – Recalls
  – Rework
  – Lost business

• **Internal cost of failures**

In 2010 a VM was fined $1.2 billion for concealing information from safety regulators related to unintended acceleration of vehicles.
### 470 Search Results - Page 2 of 47

Criteria: (All Makes All Models) for the date range 01/Jan/2013 to 01/Dec/2013

Information: Click on the recalls number to expand the detail and hover over the concern for a quick insight into the defect.

Please note that certain recalls have the same reference number, but relate to different models/variants of the same manufacturer/vehicle.

<table>
<thead>
<tr>
<th>#</th>
<th>Launch Date</th>
<th>Recalls Number</th>
<th>Make</th>
<th>Model(s)</th>
<th>Concern</th>
<th>VIN Start</th>
<th>VIN End</th>
<th>Build Start</th>
<th>Build End</th>
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<td>WDD2073730F181526</td>
<td>01/04/2012</td>
<td>30/06/2012</td>
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[1 2 3 4 5 6 7 8 9 10] Next | Last
Vehicle recalls

Department of transport agency in UK communicated 470 vehicle recalls in 2013 affecting millions of vehicles.

In April 2014 Toyota announced a worldwide recall of over 6.4 million cars, covering 27 different models, for 3 different safety issues.

ISO/TS16949: 2009

“Input to management review shall include analysis of actual and potential field failures and their impact on quality, safety and the environment”

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Reasons for recalls: Examples

- “Spiral cable assembly in the airbag module. Due to the shape and location of a retainer for the flexible flat cable in the airbag unit, there may be a risk when the steering wheel is turned of damage to certain circuits that provide connectivity to the airbag. If connectivity is lost, the airbag warning light will illuminate on the instrument panel and the driver’s airbag may be deactivated”

- “Brake fluid may leak. The rear brake pipe bracket to axle securing bolt may fail due to inconsistencies in bolt manufacture. Could lead to failure of rear brake bundy pipe, resulting in loss of brake fluid, significantly reducing braking performance”

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How effectively are the core tools implemented?

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ISO9001: 2015 focus on risk management

5.1.2 Leadership and commitment with respect to the needs and expectations of customers

a) the risks which can affect conformity of goods and services and customer satisfaction are identified and addressed;

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The development of a quality management system that provides for:

- continual improvement
- emphasising defect prevention
- the reduction of variation and waste in the supply chain

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Effective use of FMEA to identify and manage risk

“The organisation shall use a multidisciplinary approach to prepare for product realisation including development and review of FMEA’s…”
Risk Priority Number (RPN)

• RPN = Severity x Occurrence x Detection

• The RPN is a useful indicator to assess risk

• Also focus on Severity and Severity x Occurrence

<table>
<thead>
<tr>
<th>Item</th>
<th>Severity</th>
<th>Occurrence</th>
<th>Detection</th>
<th>RPN</th>
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<tr>
<td>A</td>
<td>9</td>
<td>2</td>
<td>5</td>
<td>90</td>
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<tr>
<td>B</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>112</td>
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Measurement System Analysis

“Statistical studies shall be conducted to analyse the variation present in the results of each type of measuring and test equipment system. This requirement shall apply to measurement systems referenced in the control plan. The analytical methods and acceptance criteria used shall conform to those in customer reference manuals on measurement systems analysis. Other analytical methods of acceptance criteria may be used if approved by the customer”

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Understanding measurement system variation

LOCATION
• Bias
• Stability
• Linearity

WIDTH
• Repeatability
• Reproducibility

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Statistical Process Control

Identifying changing needs and expectations

Customers

Identifying changing needs and expectations

Process/System

Inputs

Outputs

Statistical Process Control

Man

Machine

Materials

Methods

Environment

Products Services

Inputs

#SMMTWebinars
Statistical Process Control (SPC)

### Part Number: X5678

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Machine Type</th>
<th>Characteristic</th>
<th>Overall Length</th>
<th>Operation</th>
<th>Sample Size</th>
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<tr>
<td>PIPE</td>
<td>MULTITRON</td>
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<td>70mm +/- 5mm</td>
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### Specifications:

<table>
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<th>Sample Frequency</th>
<th>Date</th>
<th>Control Limits Calculated</th>
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<td>25 PART</td>
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### Chart Analysis:

- **UCL**: Upper Control Limit
- **LCL**: Lower Control Limit
- **X**: X-Bar (Sample Mean)
- **R**: Range

### Calculations:

- **Cpk** = minimum of:
  - **Cpu** = USL - X
  - **Cpl** = X - LSL

<table>
<thead>
<tr>
<th>Sample</th>
<th>A2</th>
<th>B2</th>
<th>C2</th>
<th>D2</th>
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<td>0.88</td>
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- **UCL X**: X + A2R
- **LCL X**: X - A2R

- **UCL R**: D4R
- **LCL R**: D3R

### Constants:

- **D2**: 2.326
- **D3**: 0
- **D4**: 2.11
Process Capability Cpk of Ppk

Capability 1.0 = 2700ppm
Capability of 1.33 = 64ppm
Capability of 2.00 = 0.001ppm

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ISO9001: 2015

6.3 Planning of changes

“The organisation shall undertake change in a planned and systematic manner, identifying risks and opportunities and reviewing the potential consequences of change”

ISO/TS16949: 2009

7.1.4 Change control

“The organisation shall have a process to control and react to changes that impact product realisation…. Changes shall be validated before implementation”

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Changes that may affect the review/update of Automotive Core Tools

- New product
- New process
- Modified product or manufacturing process
- New or modified measuring system
- Customer complaints
- Field failures/ warranty
- Product recalls
- Internal performance data
- Supplier issues/changes
- The process never stops!
Conclusion

• Evidence from ISO/TS16949 shows many nonconformities are due to the lack of effective implementation of the core tools

• Often driven by Quality Department without Top Management understanding or support

• Often participants “fill in boxes” without understanding basic principles

• Often not a live process, reactive rather than proactive approach

• ISO9001: 2015 will focus more on managing risk

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Balance the risk
Training and Support

• 5 day Core Tool Certification Course
  – Includes case studies, and knowledge and application exam
  – Certification from SMMT

• 1 day modules on each of the core tools

Training held at SMMT Industry Forum, Birmingham or in-house

For more information visit [www.industryforum.co.uk](http://www.industryforum.co.uk) or call 0121 7176614

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Thank you for attending

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Questions and Answers

Please click on the hand symbol to raise your hand if you have a question.

Please ensure that you are connected to the audio to ask a question.

Alternatively, you can type your question.

Email: memberservices@smmt.co.uk with your questions after this session.

Slides emailed to participants after this session.

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