SMMT
DRIVING THE
MOTOR INDUSTRY

Effective Implementation of the Automotive Core Tools

Paul Hardiman, Principal – Global Best Practice, Industry Forum
Mairi Lucas, Project Co-ordinator, SMMT

SMMT, the ‘S’ symbol and the ‘Driving the motor industry’ brandline are trademarks of SMMT Ltd

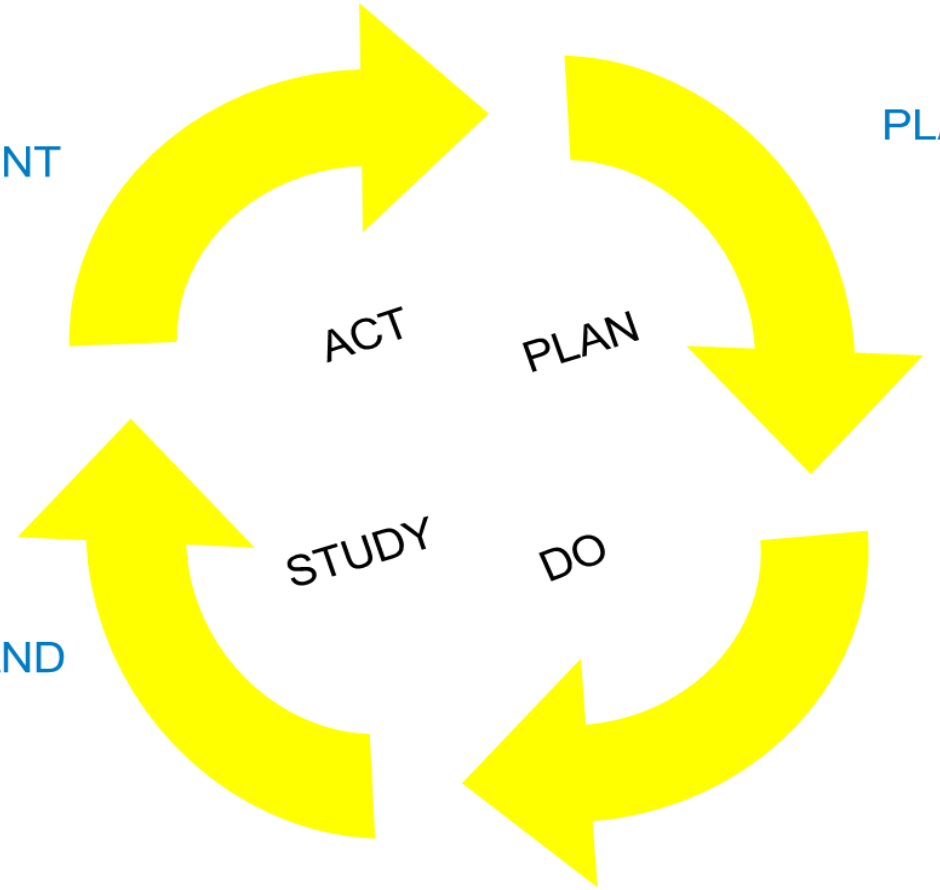
- During presentations (14:00 – 14:30) everyone will be muted so that only the presenters will be heard.
- The presentation will be followed by a Q&A session. Click on the hand symbol to show that you have a question.
- If you are experiencing any technical problems please call *0207 344 1611 or 07793 773391*

#SMMTWebinars

Paul Hardiman, Principal- Global Best Practice

#SMMTWebinars

Advanced Product Quality Planning (APQP)



CONTINUAL IMPROVEMENT

- *Put in place the actions to improve*

PLAN AND DEFINE

- *What to do*
- *How to do it*
- *Who will do it*
- *By when*

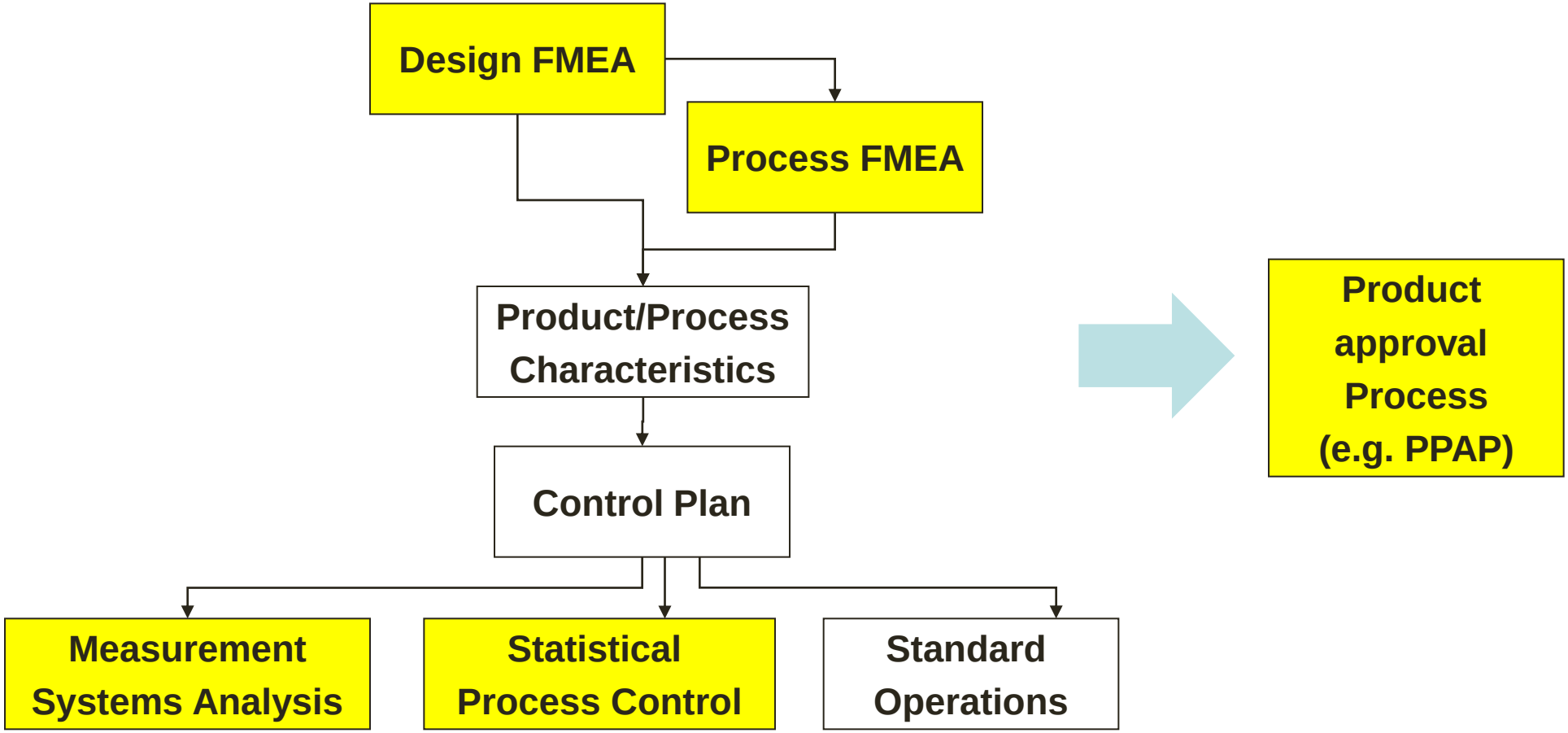
PRODUCT DESIGN/ PROCESS DESIGN

- *Do what was planned*

PRODUCT AND PROCESS VALIDATION

- *Did things happen according to plan?*

The Automotive Core Tools



#SMMTWebinars

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

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

VOSA
Vehicle & Operator Services Agency

Business Link

Home | Back

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.

#	Launch Date	Recalls Number	Make	Model(s)	Concern	VIN Start	VIN End	Build Start	Build End
11	15/01/2013	R/2013/006	NEOPLAN	Cityliner, Euroliner, Starliner and Skyliner	directional control could be compromised			01/01/1996	22/04/2005
12	15/01/2013	R/2013/006	NEOPLAN	Cityliner, Euroliner, Starliner and Skyliner	directional control could be compromised			01/01/1996	22/04/2005
13	15/01/2013	R/2013/006	NEOPLAN	Cityliner, Euroliner, Starliner and Skyliner	directional control could be compromised			01/01/1996	22/04/2005
14	15/01/2013	R/2013/002	CITROEN	Nemo	braking assistance may be reduced	VF7******C8275977	VF7******C8283182	26/06/2012	03/08/2012
15	15/01/2013	RM/2013/001	BMW MOTORCYCLES	K1300S and K1300R	braking efficiency may be compromised	ZV75262	ZV76489		
16	15/01/2013	RM/2013/001	BMW MOTORCYCLES	K1300S and K1300R	braking efficiency may be compromised	Z392527	Z393423		
17	15/01/2013	R/2013/006	NEOPLAN	Cityliner, Euroliner, Starliner and Skyliner	directional control could be compromised			01/01/1996	22/04/2005
18	16/01/2013	R/2013/003	PEUGEOT	Bipper	braking assistance may be reduced	VF3******C8276150	VF3******C8282633	25/06/2012	01/08/2012
19	18/01/2013	R/2013/005	PEUGEOT	Boxer III	handbrake may not perform correctly	VF3YCTMFC12233693	VF3YCTMFC12233693	31/05/2012	31/05/2012
20	22/01/2013	R/2012/151	MERCEDES BENZ	E-Class Coupe	airbag may not deploy correctly	WDD2073021F181805	WDD2073732F181529	01/04/2012	30/06/2012

[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

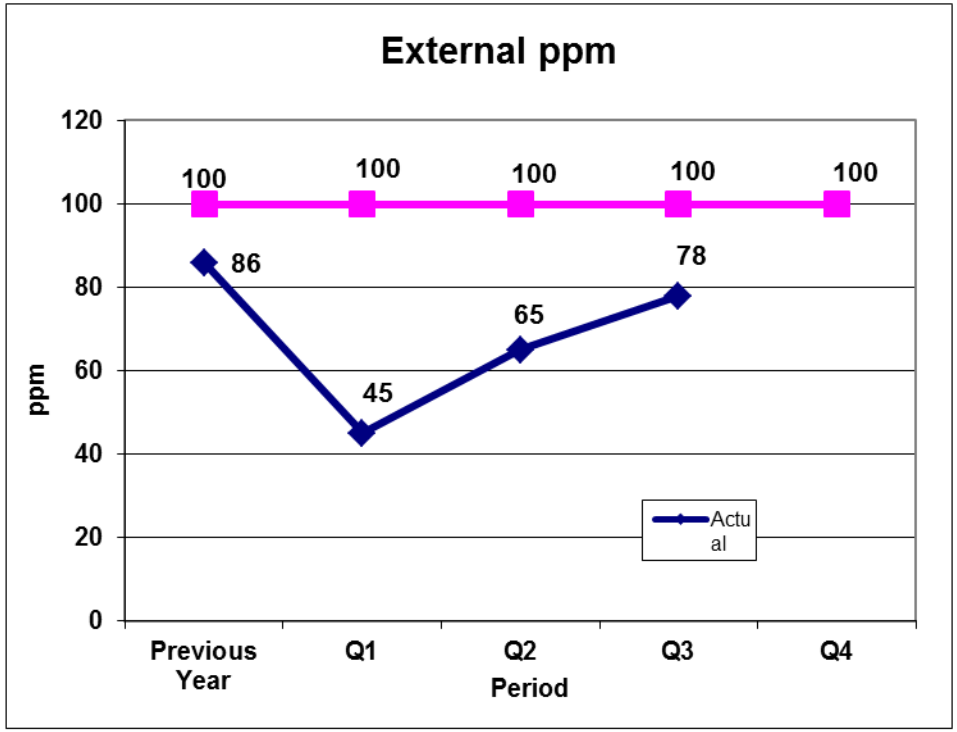
“Input to management review shall include analysis of actual and potential field failures and their impact on quality, safety and the environment”

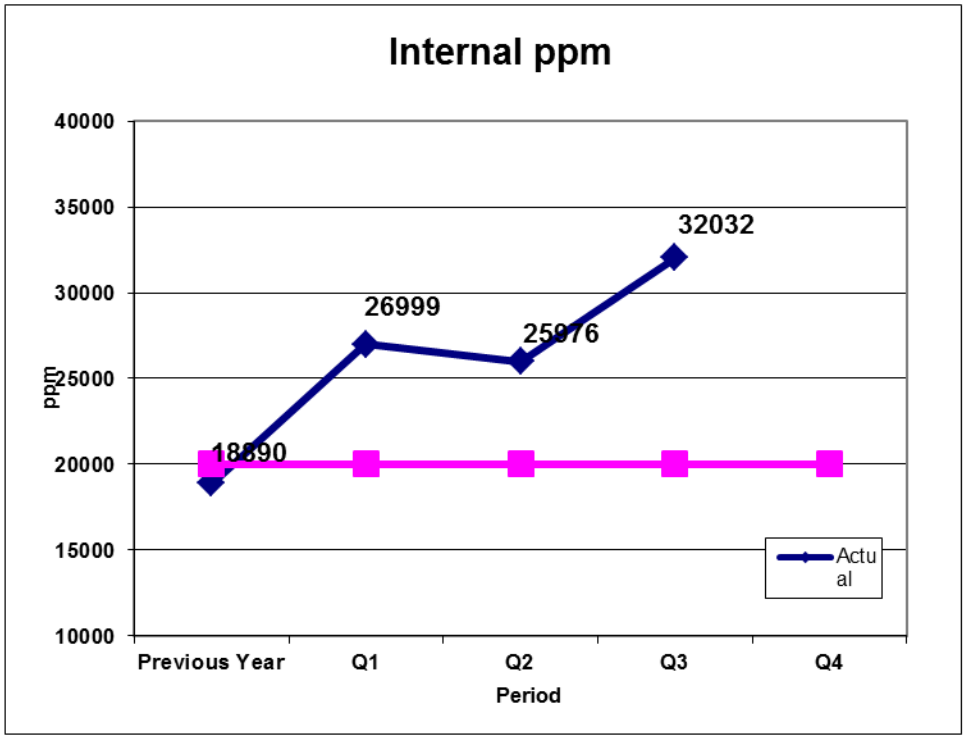
Reasons for recalls: Examples

- “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”

How effectively are the core tools implemented?





#SMMTWebinars

ISO9001: 2015 focus on risk management

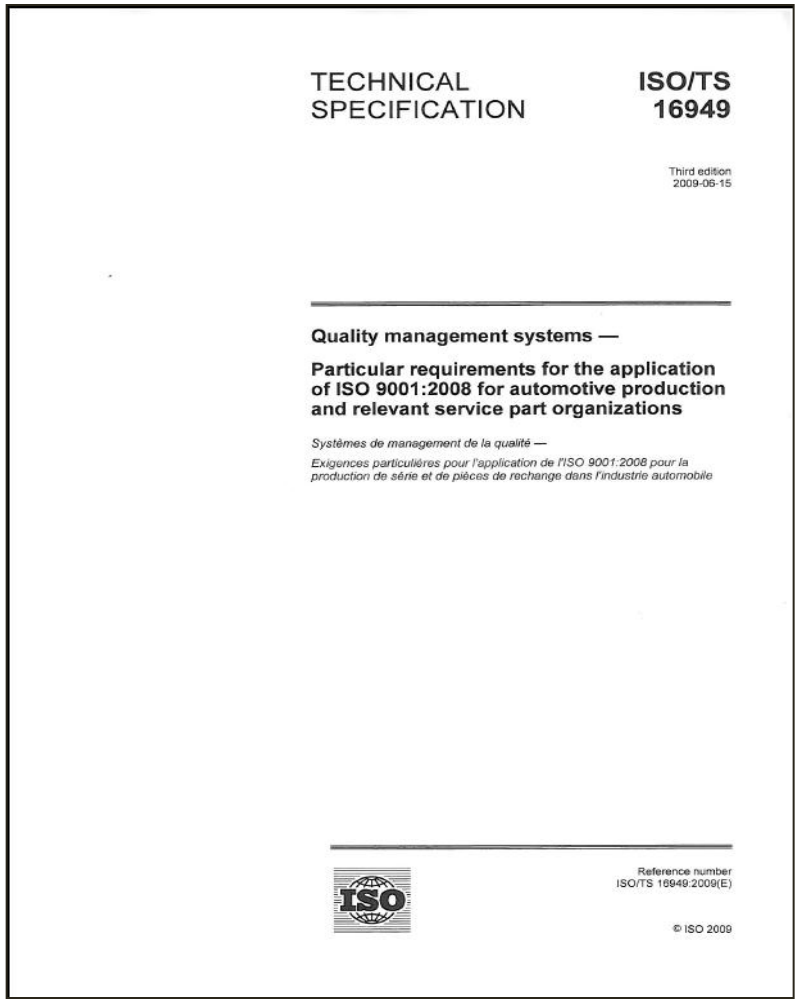
5.1.2 Leadership and commitment with respect to the needs and expectations of customers

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

Goal of ISO/TS16949

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



TECHNICAL SPECIFICATION

ISO/TS 16949

Third edition
2009-06-15

Quality management systems —

Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations

Systèmes de management de la qualité —

Exigences particulières pour l'application de l'ISO 9001:2008 pour la production de série et de pièces de rechange dans l'industrie automobile

Reference number
ISO/TS 16949:2009(E)

© ISO 2009

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…"

System

Subsystem

Component

Model Year(s)/Programs(s)

Core Team:

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS
(DESIGN FMEA)

Design Responsibility:

Key Date

FMEA Number:

Page: of

Prepared by:

FMEA Date (orig):

Item / Function	Requirement	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Classification	Potential Causes(s) of Failure	Current Design: Controls Prevention	Occurrence	Controls Detection	Detection	RPN	Recommended Action	Responsibility & Target Completion Date	Action Results: Actions Taken	SEV	OCC	DET	R.P.N.

DFMEA Form type "C" improved visibility for the relationship between prevention controls and occurrence ranking

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

Item	Severity	Occurrence	Detection	RPN
A	9	2	5	90
B	7	4	4	112

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"

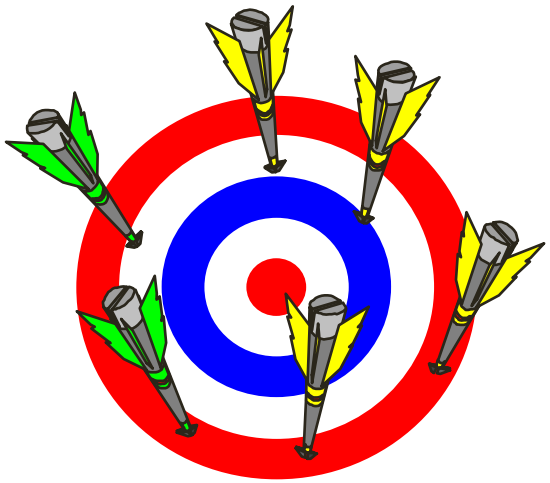
Understanding measurement system variation

LOCATION

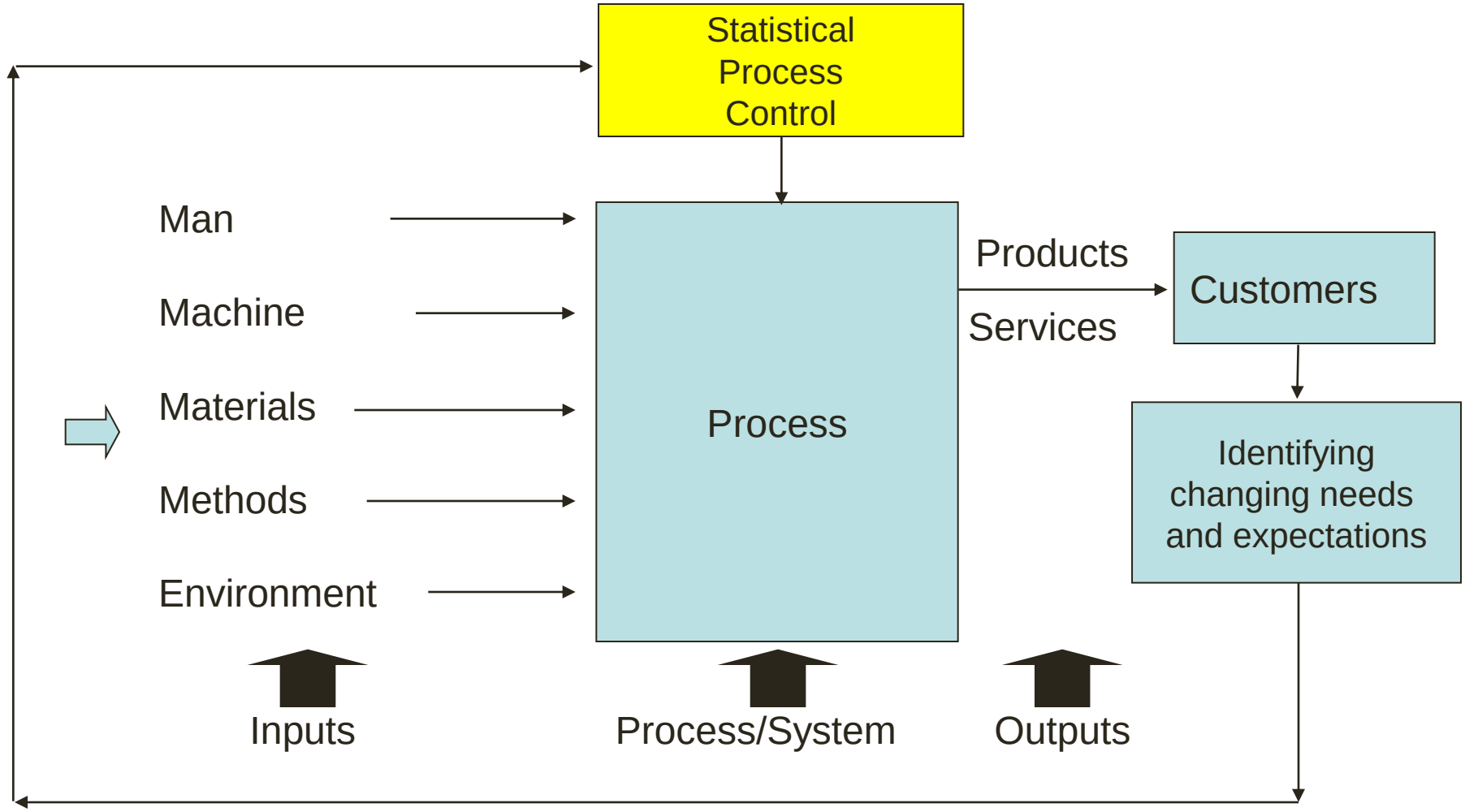
- **Bias**
- **Stability**
- **Linearity**

WIDTH

- **Repeatability**
- **Reproducibility**



Statistical Process Control

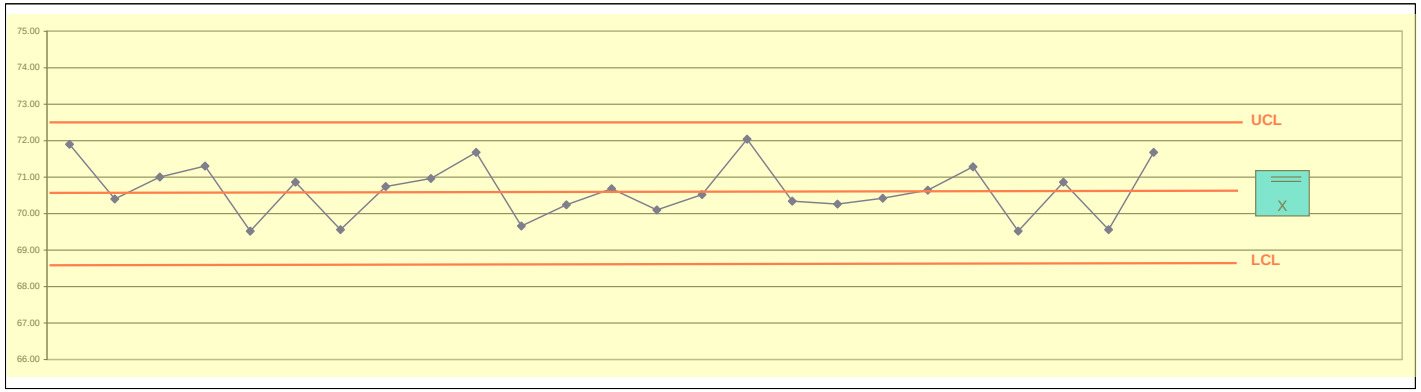


Statistical Process Control (SPC)

Part Number	Issue	Machine Type		Characteristic	Operation
X5678	C	MULTITRON		OVERALL LENGTH	BEND
Part Name		Machine Number	Section	Specification	Code / Location
PIPE		A		70mm +/- 5mm	

Sample Size	Chart Number
5	1
Sample Frequency	Date Control Limits Calculated
25 PART	Mar-31

AVERAGE X BAR



RANGE R

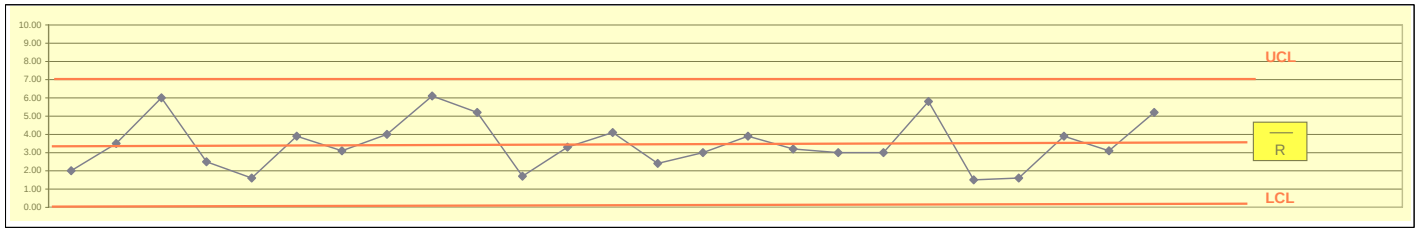


CHART ANALYSIS	
$\bar{\bar{X}}$	$\bar{R}$
70.63	3.46
$UCL\bar{X}$	UCLR
$= \bar{\bar{X}} + A2\bar{R}$	$= D4\bar{R}$
72.64	7.31
$LCL\bar{X}$	LCLR
$= \bar{\bar{X}} - A2\bar{R}$	$= D3\bar{R}$
68.62	0

RESULTS

COMPONENTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	71.0	69.5	73.5	71.0	69.2	68.7	68.8	73.5	72.8	71.6	69.1	68.6	69.0	69.0	70.3	74.0	69.6	69.0	68.3	67.2	70.5	69.2	68.7	68.8	71.6
2	72.0	68.5	70.0	71.0	68.8	70.7	69.3	69.5	66.7	71.5	70.1	70.0	69.5	69.7	68.8	72.8	68.7	70.7	71.2	69.9	72.0	68.8	70.7	69.3	71.5
3	71.5	71.0	72.5	70.5	69.1	71.1	71.7	70.0	71.1	73.3	69.2	70.9	69.1	70.2	70.1	70.8	70.2	71.6	70.2	70.5	71.4	69.1	71.1	71.7	73.3
4	72.0	72.0	71.5	71.0	70.1	72.6	69.4	70.4	71.8	73.6	69.1	71.9	73.1	71.4	71.8	72.5	71.9	71.4	71.1	72.6	70.5	70.1	72.6	69.4	73.6
5	73.0	71.0	67.5	73.0	70.4	71.2	68.6	70.3	72.4	68.4	70.8	69.8	72.7	70.2	71.6	70.1	71.3	68.6	71.3	73.0	72.0	70.4	71.2	68.6	68.4
X Sum	359.5	352.0	355.0	356.5	347.6	354.3	347.8	353.7	354.8	358.4	348.3	351.2	353.4	350.5	352.6	360.2	351.7	351.3	352.1	353.2	356.4	347.6	354.3	347.8	358.4
X Bar	71.90	70.40	71.00	71.30	69.52	70.86	69.56	70.74	70.96	71.68	69.66	70.24	70.68	70.10	70.52	72.04	70.34	70.26	70.42	70.64	71.28	69.52	70.86	69.56	71.68
Range	2.00	3.50	6.00	2.50	1.60	3.90	3.10	4.00	6.10	5.20	1.70	3.30	4.10	2.40	3.00	3.90	3.20	3.00	3.00	5.80	1.50	1.60	3.90	3.10	5.20

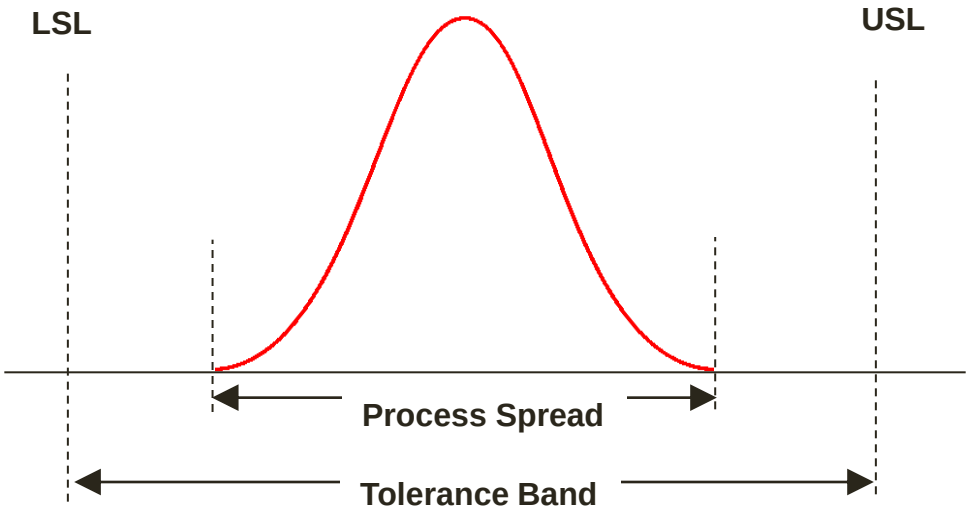
Cpk = minimum of :-	
$Cpu = \frac{USL - \bar{\bar{X}}}{3sd}$	$Cpl = \frac{\bar{\bar{X}} - LSL}{3sd}$
=	=
$1sd = \bar{R}/d2$	Cpk =

Constants for n = 5
D2 = 2.326
D3 = 0
D4 = 2.11
A2 = 0.58

STATUS

Log	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Time	8:30	09:00	09:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30					
Date	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7					
Sig																														

Process Capability Cpk of Ppk



Capability 1.0 = 2700ppm

Capability of 1.33 = 64ppm

Capability of 2.00 = 0.001ppm

#SMMTWebinars

Ongoing Change Control

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"

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

- New product
- New process
- Modified product or manufacturing process
- New of 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

Balance the risk

#SMMTWebinars

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
or call 0121 7176614

Thank you for attending

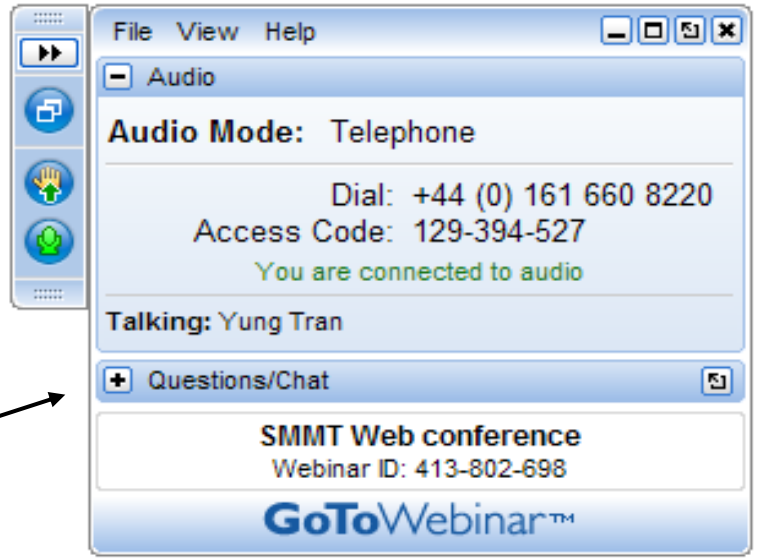
#SMMTWebinars

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.

#SMMTWebinars