Smallpeice Enterprises
a division of GP Strategies Limited

New Product Development
Training Calendar

Specialist Toolkit Training

In-Company Options

Consultancy Support

train@smallpeice.com

NPD Training

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The Smallpeice suite of New Product Development modules provide specialist training for design engineering and associated functions.

Choose between stand-alone tools & techniques workshops or link the training to your company product development framework with a bespoke group training programme.

In-Company Group Training

We can organise a closed course for your company either onsite or via live virtual delivery.

Consultancy & Coaching

A consultancy approach is also available for focused applications such as FMEA – where companies seek to embed a shared framework for best practice.

For bookings & enquiries
email train@smallpeice.com
Tel +44 (0)1926 336423 • www.smallpeice.com

APQP

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In-Company

- Available for in-company group training with groups of up to 12 attendees
- Customised per company

This course concentrates on the essentials of APQP & PPAP process required to set-up new product development in accordance with QS9000. It is suitable for anyone involved in managing, planning, designing or implementing new product designs and corresponding manufacturing processes. It covers the 5 phases of APQP & PPAP – making links to supporting tools such as QFD, FMEA, & the 'Quality Umbrella'. Following attendance, participants will gain:

- An understanding of the AIAG 'APQP' & 'PPAP' manuals and their overall requirements.
- The development of a Training Needs Analysis for tools such as FMEA, SPC & MSA.
- A gap analysis of each of the 5 phases between the APQP/PPAP requirements & current practice within the client company
- A draft action plan for any work identified as being required, based on the assessment of gaps, for example in relation to the company's New Product Introduction Process.

Programme of content

Introduction

- Course & delegate objectives
- Quality planning: why / who / how ?
- Product quality planning timing chart

APQP Phase I: Plan & Define Programme

- Inputs & outputs: (Inputs for section II)

APQP Phase II: Product Design & Development

- Outputs: (Design) FMEA, design review
- Outputs: (APQP Team)
- Control plan, cause & effect diagram

APQP Phase III: Process Design & Development

- Outputs: measurement system analysis

APQP Phase IV: Product & Process Validation

- Outputs: variation, process capability

Part Approval: PAP

- PPAP manual
- Reporting requirements
- Submission, records

APQP Phase V: Feedback, Assessment, Corrective Action

- Outputs: Improved; QCD & APQP process.
- Management support, 'throughout'

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Introduction to DFSS

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Design for Six Sigma (DFSS) enables companies to deliver competitor-beating products to market in less time and at lower cost. DFSS presents a new product development approach which combines the most powerful tools and methods known today to enable optimised product designs to be produced and verified. The DFSS method is intended to be used to support the front-end design of complex systems and to complement the existing new product development processes within a company. DFSS not only enables faster and higher quality product development but also helps teams to identify stronger, more innovative solutions to important customer needs. This course aims to introduce product developers to the DFSS tools and approach through a series of interactive hands-on workshops.

Programme of content

Introduction to DFSS

- Why Design for Six Sigma?
  - The time-to-market challenge
  - Why variation is the real enemy
- What is DFSS?
  - The right tool at the right time
  - Overview of the DFSS steps - DMADV

Define & Measure

- The DFSS project charter
- Capturing the Voice of the Customer
- Prioritising Customer Requirements
- Defining good measures

Analyse

- Basic brainstorming rules
- Framing the problem
- Pugh Convergent Design
- Risk Assessment using FMEA

Design

- Removing outliers through mistake proofing
- Simplifying the design
- Experimenting to optimise performance and reduce variation

Verify

- Fundamentals of verification
- Design margins and robustness
- Process Stability and Capability

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Quality Function Deployment

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QFD is a powerful development technique that ensures customer requirements drive the new product introduction process. Simple matrices are used to capture & analyse information, & delegates progress through the key stages of prioritising customer requirements & technical characteristics, selecting concepts, design deployment & production control, & managing the overall QFD process.

- Understand what makes a good product requirements specification
- How the Voice of the Customer is captured and translated into a product performance specification
- Practice the keys tools of the QFD technique
- Understand the links between engineering specifications

Programme of content

Introduction to QFD

- QFD purpose & structure
- The benefits of QFD within NPD
- Overview of the QFD rooms

Customer Focus

- Capturing & reviewing the VOC
- Categorising & prioritising customer needs
  - KANO model
  - Using Paired Comparison
- Needs Assessment
  - comparing current products against needs
  - product strategy using SWOT

Product Focus

- Defining product purpose using Functional Analysis
- Identifying performance characteristics
- Using correlation & relationship matrix
- Performance prioritization & targets
- Performance assessment

Further QFD Phases

- The specification cascade
- Linking DFSS tools to the cascade

Case Study Exercise

- Checking understanding, and practicing the tools in the various QFD phases

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Concept Generation & Selection

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The tools of Concept Selection can be used to help take the best concept forward for refinement in the detail design part of the process. Using a structured approach avoids weak concepts and project delays and disruption occurring.

- Show how relevant creativity tools support the Design & Development Process
- Understand how to create an environment for new ideas
- Generate the triggers for alternative solutions using Functional Analysis
- Practice key creativity tools
- An overview of the TRIZ technique
- Practice a number of different concept selection tools and understand their differences

Programme of content

Introduction to Creativity

- Why develop alternative solutions?
- What is creativity?
- Thinking types
- The use of stimuli

Creativity Tools

- Brain storming
- Mind mapping
- Analogy & related words
- Lateral thinking
- TRIZ

Concept Selection

- The benefits of effective and timely concept selection
- Concept examples generation
- The set of evaluation criteria and their priority

Selection Tools

- Basic classification
- Paired comparison
- Bubble chart
- Radar chart
- Basic evaluation
- Controlled convergence
- Tools strengths & weaknesses

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Design FMEA

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Design FMEA is an early development 'gateway' module to identify & assess the key design risks facing a project team.

- How to correctly scope a DFMEA
- Understand and practise the DFMEA method
- Be aware of the common mistakes
- Understand how DFMEA links with other NPD tools

Programme of content

Introduction to Design FMEA

- The importance of risk management
- The DFMEA method & language

Failure Modes, Effects & Severity

- Scoping the DFMEA & specifying failure modes
- Potential effects of the failure mode & grading effects
- Giving failure modes a status

Causes & Occurrence

- Identifying potential causes of the failure mode
- What cause prevention control is in place ?
- Grading the causes for occurrence

Control & Detection & Risk Review

- Evaluating the design & grading detection controls
- Risk review & identification of weaknesses
- Mitigating future risk & avoiding the pitfalls
- DFMEA governance & maturity

Also available . . .

AIAG VDA FMEA

The automotive AIAG and VDA standards organisations have collaborated to produce an FMEA handbook which is being adopted by many car manufacturers. This course covers the new guidelines for both design and process FMEA applications. It is designed to make it easier to transition from current practice to the one in the new handbook. This training is suitable for those who already have knowledge of the basic FMEA method and want to see how the AIAG handbook differs from their current FMEA practice.

Part 1 - FMEA using the AIAG VDA Handbook

- Overview of the Handbook structure
- FMEA language, types & links
- The 7 Step FMEA method

Part 2 - Design FMEA aligned with AIAG VDA

- System analysis; failure analysis & risk mitigation
- Risk communication

Part 3 - Process FMEA aligned with AIAG

- System analysis; failure analysis & risk mitigation
- Risk communication

Part 4 - Review of FMEA aligned AIAG VDA

- Method structure & supporting documents

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Process FMEA

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Process FMEA is a mandatory requirement for most companies and also provides a framework to drive continuous improvement activities. This 1-day workshop overviews the process steps, including incoming sources of variation – using process flowchart and characteristic matrix. The training reviews the different types of testing and analysis used to identify failure modes, effects and severity and examines how to calculate the Risk Priority Number and select suitable corrective actions.

- Introduce a structured approach to Process FMEA that maximises benefits and reduces risk
- Link the Process FMEA to product design requirements
- Link the Process FMEA to current controls and the quality plan

Programme of content

Introduction to FMEA

- The need for FMEA, its objectives and benefits
- The responsibility of the FMEA team

Defining the Process

- Overview of the process steps, including incoming sources of variation
- Process flowchart (chunking processes into logical steps)
- Characteristic matrix (linking important process steps to product characteristics in order to identify potential failures)

Failure Modes, Effects and Severity

- Types of testing and analysis
- Setting priorities using the severity rating scale

Cause and Occurrence

- Multiple causes of failures and defects
- Cause analysis and countermeasures
- Using the Occurrence Rating Table

Current Controls & Detection

- Evaluating the effectiveness of process based controls using the detection rating table

Risk Priority Number and Corrective Actions

- Working out the RPN and options for corrective actions, and re-scoring the FMEA

Management of Process FMEA

- Key pointers in the improvement of FMEA using a team-based approach

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Design for Assembly

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One of the most powerful techniques for reducing production costs, DFMA forces designs to be analysed for assembly ease and shows how to re-design to reduce time-to-market, and increase production efficiency.

- Show how DFA supports the deliverables of design
- Recognise the links to other design tools
- Using DFA tools to assess a design and identify improvement opportunities

Programme of content

Introduction to Design for Assembly

- The influence & impact of design on assembly
- The DFA analysis method
- The consequences of poor DFA practice

Analysis Method

- Set up; scoping; difficulty analysis
- Review each product part for DFA difficulties
- Minimum part count & challenging part existence

DFA Design Index

- How good is the current design?
- Redesign & improvement; redesign analysis
- How good can a new design be?

Method Review & Application

- The strengths of the DFA method
- How DFA is normally applied

Also available . . .

Design for Manufacture & Assembly

This additional module can be added to the core DFA training.

- Linking Design for Assembly to Design for Manufacture
- Identifying potential manufacturing problems early in the cycle
- DFM process steps to a robust, cost effective part design
  - Scope interfaces
  - Functional description
  - Interface performance values
  - Part feature specification
  - Prioritise part features
  - Understand process variability and cost
  - Review process capability and cost
  - Re-design and/or re-specify process

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Value Engineering

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This training workshop is a gateway module to identify the value and cost issues facing a design team. These are then assessed to determine what actions are necessary to address them. The VE method is fully described and practiced, showing delegates how to assess any product design to optimise its value to the customer.

- Appreciate how value optimisation can help to optimise a product's design
- Explain the benefits of applying the value analysis method & show where it should be used
- Apply the value analysis method to identify areas of a design that give poor value
- To highlight where the cost is high compared with the function priority
- Identify potential improvements in the value of a product or service

Programme of content

Introduction to Value Engineering

- The concept of value
- Understanding the different types of value
- The value engineering method

Identify

- Defining the analysis subject
- What information is required?
- Product functionality

Assess

- The product / design relationship
- Functional cost analysis
- Functional worth analysis

Control

- Value optimisation
- Change implementation

Method Review & Application

- The strengths and weaknesses of the VE method
- How is VE is normally applied

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Design of Experiments

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Poor understanding of the interactions between key inputs & their effect on customer-critical outputs often leads to under-performance of products/ processes. This course navigates through the myriad of approaches available, providing guidance on best practice & application. It is suitable for anyone tasked with increasing product or process quality - or reducing costs within design, engineering or manufacturing

- To provide logical steps confirming what is required to conduct a Design of Experiment
- To enable assessments and alternative options when an experiment becomes large and uneconomic to perform
- To provide a step-by-step analysis of each type of experiment plus the use of Minitab Statistical Analysis

1-day introduction

Introduction to Design of Experiments (DoE)

- The application and benefits of DoE
- Stages of experimentation

Planning an Experiment

- Factors and levels

Designing an Experiment

- Design options
- Replication & Randomisation

Analysis Refinement and Optimisation

- Analysing results
- Visualising results
- Optimisation of confirmation

Signposting Additional Techniques

- Fractional factorials designs
- Response surface techniques

Additional 2-days of advanced techniques

Advanced (Taguchi) Design of Experiments

- Benefits & limitations of Factorial DoE techniques
- Taguchi loss function and how it can be used
- Explanations of signal and noise as used in Taguchi DoE
- Determining levels and design selection
- Generating main effects plots
- Using the results of a Taguchi experiment

Advanced (Response Surface) Design of Experiments

- Why use response surface methodologies
- Assessing the correct design space
- Adding axial (star) points and quadratic terms to the DoE
- Reading contour and surface plots
- Setting goals, limits and desired output response from the experiment

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Measurement System Analysis

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Manufacturers are becoming increasingly aware of the need to obtain adequate confidence in their measurement systems. This is important for process control, for the assurance of quality, and for process improvement. This highly practical course will enable delegates to assess the performance of new and existing measurement systems, and considers how improvements can be introduced when they are found to be necessary.

- Introduce the concepts of factual measurement
- Explore the types of data that MSA can be applied to
- Provide a user viewpoint of measuring equipment calibration
- Provide a practical user method qualification for taking measurements
- Demonstrate why measurement is important and what can be done to improve a measurement system

Programme of content

Introduction to Measurement Systems Analysis

- What MSA is
- Why it is important
- Repeatability and reproducibility

Types of Data and Collection

- Common vs. special causes of error
- Value and feasibility of collecting data
- Exercise: barriers to data collection
- Types of data

Qualifying the Measurement System

- Using a gauge for measurement
- Interpreting the results
- Destructive measurement systems
- Conditions that need to be considered
- Actions for improvement
- Re-evaluating the measurement system
- MSA when a gauge cannot be used
- Case studies & examples

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BS8888 Basic Draughting Principles

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This 1-day course concentrates on the key principles required to read & interpret engineering drawings. Exercises are used to bring to life and highlight the importance of this essential (but often weak) design skill. Delegates will learn how to correctly apply dimensions and tolerances of size, and the training will cover the key skills of line convention, lettering, scales, projection methods, screw threads, dimensioning & surface texture.

- How to apply dimensions and tolerances of size
- Importance of communication standards
- Increasing efficiency and economy in time & materials
- Removing barriers caused by differences in practices

Programme of content

General Principles & Basic Conventions

- The essential foundation skills
- Correct engineering drawing requires the use of different line types and styles to represent different elements of the finished product, and to avoid confusion in interpretation
- Producing lines via CAD systems

Lettering & Scales

- The importance of lettering, & different text styles
- How to use BS8888 standard for preferred scale factors when converting full-size CAD drawings to scale factor plots

Projection Methods

- Understanding the choice between first and third angle projections

Screw Threads

- Some 3D modelling systems have the ability to show screw threads in a graphical form, however 2D drawings do not require this level of details
- Examines how to represent both internal and external screw threads
- Welding symbols

Dimensioning

- When to add tolerances & why needed
- How to check that tolerances are correct

Surface Texture

- When machining components, the surface finish will be important to the end user, and this section examines how to state and interpret different types of surface finish

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Geometric Dimensioning & Tolerancing

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This 2-day course is aimed at delegates who have little or no knowledge of using Geometrical Dimensioning and Tolerancing (GD&T). The course is suitable for all engineers as the objectives are to provide a basic understanding of the symbols and how they can be used to solve problems. The course helps to provide a consistent understanding of GD&T within your company.

- Understand why Geometric Dimensioning is needed and explain how it is correctly applied
- Demonstrate when and where to use GD&T
- Review the relevant standards

Programme of content

Introduction
- Understanding tolerances & why use GD&T
- Types of tolerances

The Standards
- BS 8888 and ISO; ASME Y 14.5; GPS

Tolerance Indicator & Zones
- Styles and types
- Attaching
- Cylindrical / Width

Theoretical Exact Dimensions
- What is a TED?
- How TED's are used

Single features
- Straightness; Flatness; Roundness; Cylindricity

Profile Tolerances
- Line & Surface Profile

Related Features
- Parallel
- Perpendicular
- Angularity
- Position
- Co-axiality
- Symmetry
- Circular runout
- Total runout

Maximum Material Condition
- The bonus tolerance
- Zero tolerances

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