Level 5 – Continuous Improvement with Industry 4.0

Control 1 – Control Plans

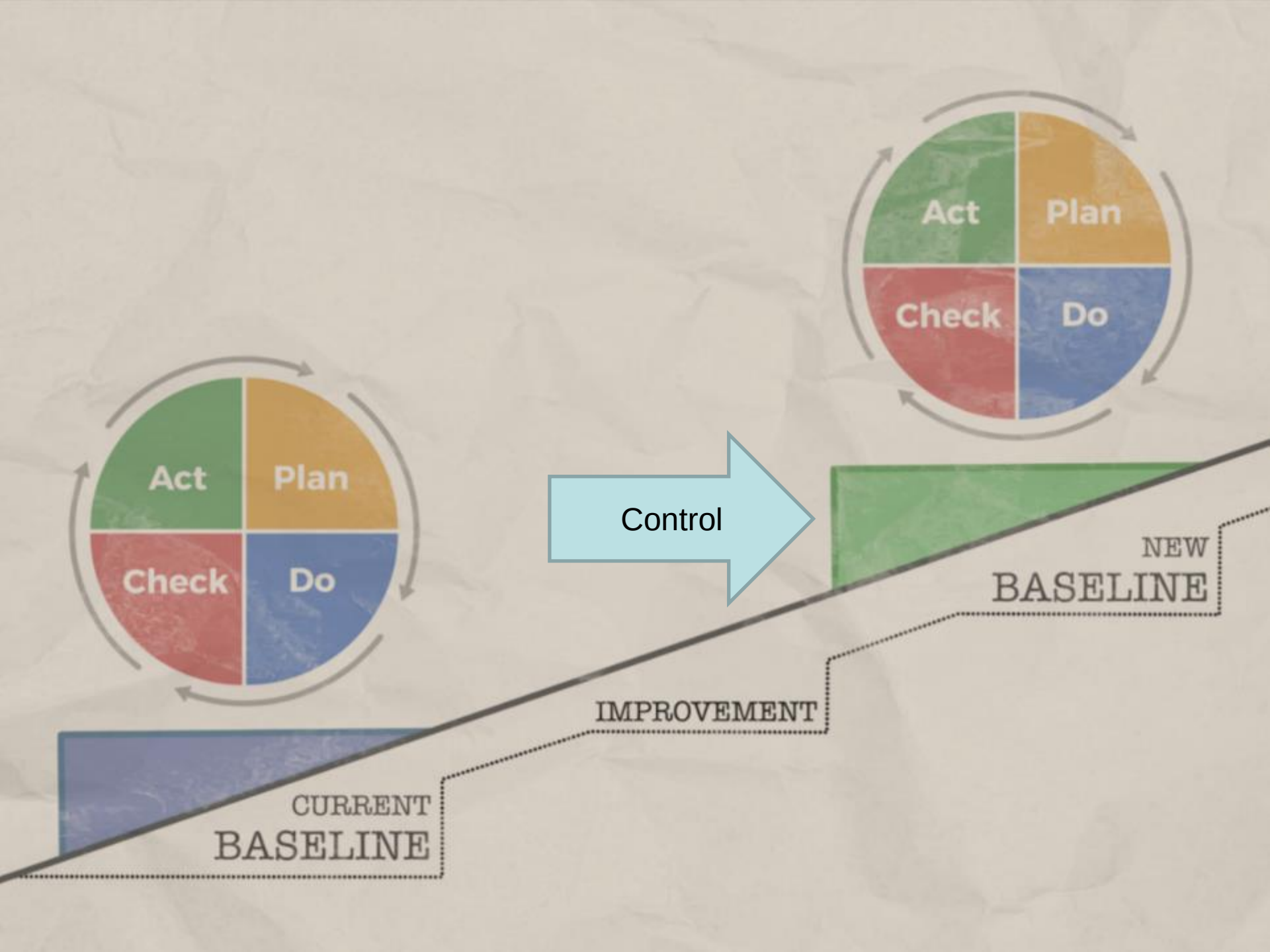
MANUFACTURE ADVANCED DESIGN ENGINEERING

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Cronfa Gymdeithasol Ewrop
European Social Fund

Control

- To find ways to maintain process improvements and develop robust systems so the wins are not lost


Act
Plan
Check
Do
Control
Act
Plan
Check
Do
NEW
BASELINE
IMPROVEMENT
CURRENT
BASELINE

Document the Change – Control Plans

- A way to ensure process gains are held and the ‘old’ ways of doing things don’t reappear

- A method of documenting and formalizing the functional requirements of quality control to be implemented so that quality standards are met for a particular task or service

- Is a link between FMEA’s and work instructions

Document the Change – Control Plans

- This may include:-
- Frequency a process is reviewed
- Verification that MSA is acceptable
- Typical corrective actions
- History of process capability

Document the Change – Control Plans – things to consider

- Identify the process owner
- Involve the team in the control plan
- Gain agreement between the process owner and the team
- Create or update work instructions (SOP)
- Notify and train the personnel
- Place control plan in the appropriate quality system document

Document the Change – Control Plans – things to consider

- Control plans list the product and process characteristics monitored during manufacturing including the measurement methods and necessary reaction plans for deviants
- Generally, they do not improve quality but play an important part in sustaining product quality long after a process has been developed or modified

Document the Change – Control Plans – things to consider

- Without control plans most processes will slip and drift into a state of disrepair due to knowledge loss, staff turnover and short-term production priorities

Document the Change – Control Plans – things to consider

- FMEA's have been conducted on all of the process steps and the team fully understands the quality risks with each of these steps
- Process and product measurement methods clearly defined and are repeatable
- An overall quality system ensures that new employees are trained in following the control plans (via shopfloop process instructions)

The Key to Quality Control

- Prevent defects at the point of origin is the most efficient form of process control
- This is known as ‘poka yoke’ as previously discussed
- Another example is the larger diesel pump nozzle preventing diesel being put into a petrol car

Control Plan Example

Control Plans

CONTROL PLAN

Control Plan Number ABC101-23		Key Contact/Phone John Stone - Mfg Engineer, x5412	Date (Orig.) 1/1/10	Date (Rev.) 12/11/11
Part Number/Latest Change Level Sub-Assembly 987-00		Core Team C. Stone, J. Leard, D. Moores, G. Boyd, S. Miller	Customer Engineering Approval/Date (If Req'd.) N/A	
Part Name/Description Leg, Support, and Armrest Asm		Supplier/Plant Approval/Date 12/9/11	Customer Quality Approval/Date (If Req'd.) N/A	
Supplier/Plant In-House (Kansas City)	Supplier Code N/A	Other Approval/Date (If Req'd.) Ed Stumpek, Eng VP (12/10/11)	Other Approval/Date (If Req'd.) N/A	

PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS NO.	CHARACTERISTICS PRODUCT	CHARACTERISTICS PROCESS	CTQ?	METHODS PRODUCT/PROCESS SPECIFICATION/ TOLERANCE	METHODS EVALUATION/ MEASUREMENT TECHNIQUE	METHODS SAMPLE SIZE	METHODS SAMPLE FREQ.	METHODS CONTROL METHOD	REACTION PLAN
1	Place leg, support, and armrest in assembly fixture	Fixture 987-01F1	1D		Parts placed properly in fixture per drawing 987-00	N	Parts oriented correctly (reference drawing 987-00 with any questions)	Error proofed - parts cannot be mis-oriented	N/A	N/A	Error proofed	None required
2	Drive two screws to secure side support	Electric screwdriver 987-01A1	2D	Final screw depth		N	Screw heads sub-flush	Flush gage	5	Hourly	P-Chart	Re-inspect all product since last inspection and rework if needed
			2P		Drive torque on screw	Y	Torque between 10 in-lb and 13 in-lb	Automatically monitored with electric screwdriver - **alarm will sound if torque is out of range**	100%	N/A	100% monitoring	If torque alarm sounds, stop production, verify proper screws, check pilot hole diameter. If correct, contact maintenance and engineering.
3	Drive three screws to secure arm rest	Pneumatic screwdriver 987-01A2	2D	Screws seated sub-flush		N	Screw heads sub-flush	Slide flushness gage over screw locations - must move freely	5	Hourly	P-Chart	Re-inspect all product since last inspection and rework if needed

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Control – Standard Operating Procedures (SOP)

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Standard Operating Procedures (SOP)

- A SOP is a document which describes a set of operational steps in-order for a routine to be undertaken uniformally and safely
- They aim to optimize quality and performance
- They can act as an aid to training operators - although they are not a substitute for training
- They are the workplace link with FMEA’s and control plans

Standard Operating Procedures (SOP)

- Should be generated as part of a team with area operator involvement
- Include any area specific safety requirements ; PPE, specific permits, special equipment etc
- Itemise the operation step by step
- Include any care points to maintain quality (might be generated by FMEA and highlighted by control plan)

Standard Operating Procedures (SOP)

- Pictures can be included to clarify specific actions or care points
- Signed off as approved by area supervisor
- Can be approved by area HS&E representative
- Show approved date and revision number
- Displayed within the work area so easily accessible for clarification

Standard Operating Procedures (SOP)

STANDARD OPERATING PROCEDURE.			
Title	Measurement of Membrane on Planar Measuring Machine		
Area	W Bay - Sheet Finishing	Owner	N.Bourton
Purpose	Measuring Membrane		

Document Ref:	QP - draft		
Revision	1		
Date	20/07/2017		
Page	1	of	5

Ensure all appropriate PPE is worn

Environmental Responsibility:

No	Steps	Equipment	Explanation / Example / Comment
1	General Planar Measurement Machine - before using check machine within calibration Check machine bed is clean of all debris Check that panel edges are clean and free of debris (particles and hydraulic oil) which could give false readings		
2	Turn on main power power to RH side Turn on projector by pressing white button Turn on computer by pressing 'blue' button		
3	Main power isolator		
4	Sockets for main power supply to unit and computer		
5	Screen can be turned on by either remote control or by pressing button on LH side of screen		

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Authorisation:

	Quality & Technical	HS & E Manager	Manufacturing
Signature:	.....	.....	.....

Standard Operating Procedures (SOP)

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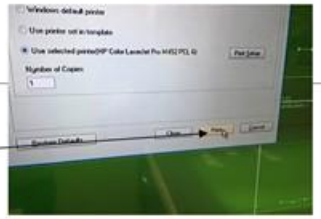
16	Load panel onto machine bed - does not need to be perfectly square but within the black dots on edgesInspect membrane by pressing 'Autoinspect' button from RH side Tool Bar		
17	Screen will either show 'Pass' or 'Fail' - if fail refer to inspection report and SPC chart to identify non conforming characteristic and either wipe component and re-measure or adjust shears		
18	Each characteristic measurement will be plotted on SPC chart - if there is drift on any measurements there may be action needed i.e. compensation on shears due to blade wear To inspect another panel repeat steps 12 -16 - ~~DO NOT FORGET TO CHANGE PANEL BATCH OR ID~~		
19	<u>Printing Report</u> Move cursor to large screen and click on 'print report' from pull down menu on 'report' task bar		
20	Choose number of records to print (this will be batch size)		
21	Press 'print' for report to be sent to printer - ensure printed record is complete with all panels inspected - add to WOT package		



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Standard Operating Procedures (SOP)

- Do SOP's exist for the process being reviewed?
- Are they simple and understood?
- Are they being followed?
- Are they current and up to date?
- Is the operator trained and is this documented?
- Is there a process audit schedule?

Standard Operating Procedures (SOP)/Training

- SOP's not an alternative to 'on the job' training
- Training must be appropriate to the task being undertaken
- Cover all aspects of the job
- Undertaken by suitably experienced and trained personnel
- Long enough for the trainee to experience the majority of situations which could be encountered
- Include documented sign-off of all the competencies required to satisfy regulatory requirements
- Records held by HR and displayed within work areas

Standard Operating Procedures (SOP)/Training

Team Member	Role	Six Sigma	Microsoft Office	PC Hardware	Infrastructure	Q
Trevor Janes	BI Analyst	Advanced	Competent	Basic	Basic	Advanced
Maria Suttkey	Python Programmer	Basic	Basic	Advanced	Basic	Trainer
Nero Crowley	BI Analyst	Advanced	Advanced	Basic	Basic	Advanced
Ozzy Mainbach	Server Technician	Basic	Advanced	Trainer	Competent	Basic
Seth Sirkin	PMO	Advanced	Trainer	Basic	Basic	Basic
Louisa Kent	Python Programmer	Basic	Advanced	Advanced	Basic	Trainer
Hector Iniesta	Java Programmer	Competent	Competent	Basic	Basic	Competent

Legend	
Basic	Requires Basic Training
Advanced	Requires Adv Training
Competent	No Training Necessary
Trainer	Expert Level

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Project Management Templates

Standard Operating Procedures (SOP)/Training

MADE

INITIAL COMPETENCY ASSESSMENT SKILLS CHECKLIST—
OCCUPATIONAL THERAPIST

Name: _____

Date of Employment: _____ Date Completed: _____

Self Assessment				Competency for the Occupational Therapist	Proficiency Required	Evaluation Method	Competency Validation Indicated by Preceptors Initials and Date
Do you have experience with this skill?		Are you competent performing the following:					
YES	NO	YES	NO				
				VITAL SIGNS/ BP & PULSE			
				a. Demonstration of BP & Pulse testing			
				b. Verbalization of alternate measure placements			
				c. Pulse Ox reading			
				d. Verbalization of HR/Pulse parameters			
				e. Indications for taking vital signs			
				ROM/GONIOMETRY			
				a. Demonstration of using goniometer at selected joints			
				b. Demonstration of checking functional ROM (recognizing pain limitations)			
				c. Demonstrate assessment of end feel/joint integrity			
				d. Verbalization contraindications for ROM testing			
				MMT/STRENGTH			
				a. Demonstration of testing muscle strength at selected joints (use of dynamometer as indicated)			
				b. Verbalization of testing functional strength			
				c. Verbalization contraindications for MMT testing			
				BALANCE			
				a. Verbalization of balance assessment during functional activities			
				COORDINATION			
				a. Examples of coordination/gross motor function tests (finger to nose, heel to shin, heel to toes, alternating rapid movement, cross body movement)			
				b. Fine motor-functional dressing, buttoning, managing zippers			
				SENSATION/PROPRIOCEPTION			
				a. Verbalization of examples of sensation tests (Hot/Cold, Two point, Sharp/Dull, Light Touch/Pressure)			
				b. Recognize deficits in proprioception and provide treatment strategies			