UKOPA

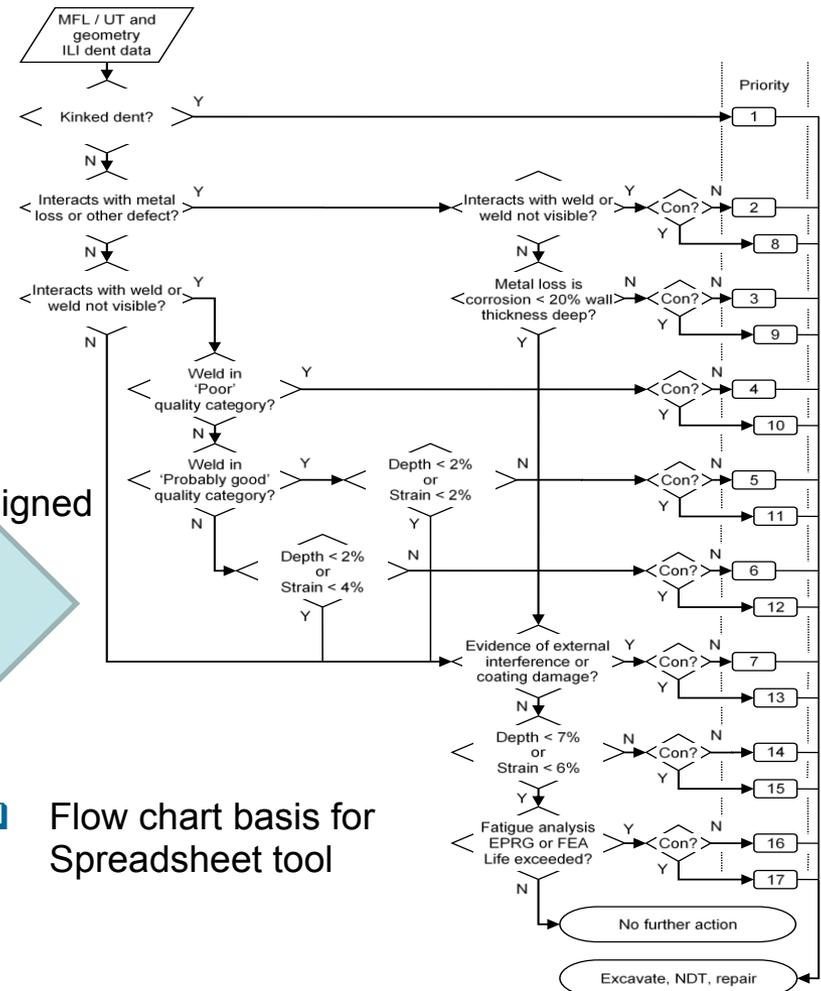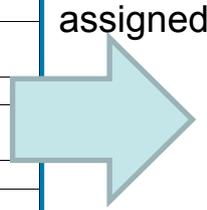## United Kingdom Onshore Pipeline Operators' Association

UKOPA Dent Management Strategy Tool

Dent Management Strategy

- Tool to assess dents following ILI
- Based on DMS from document UKOPA/14/016
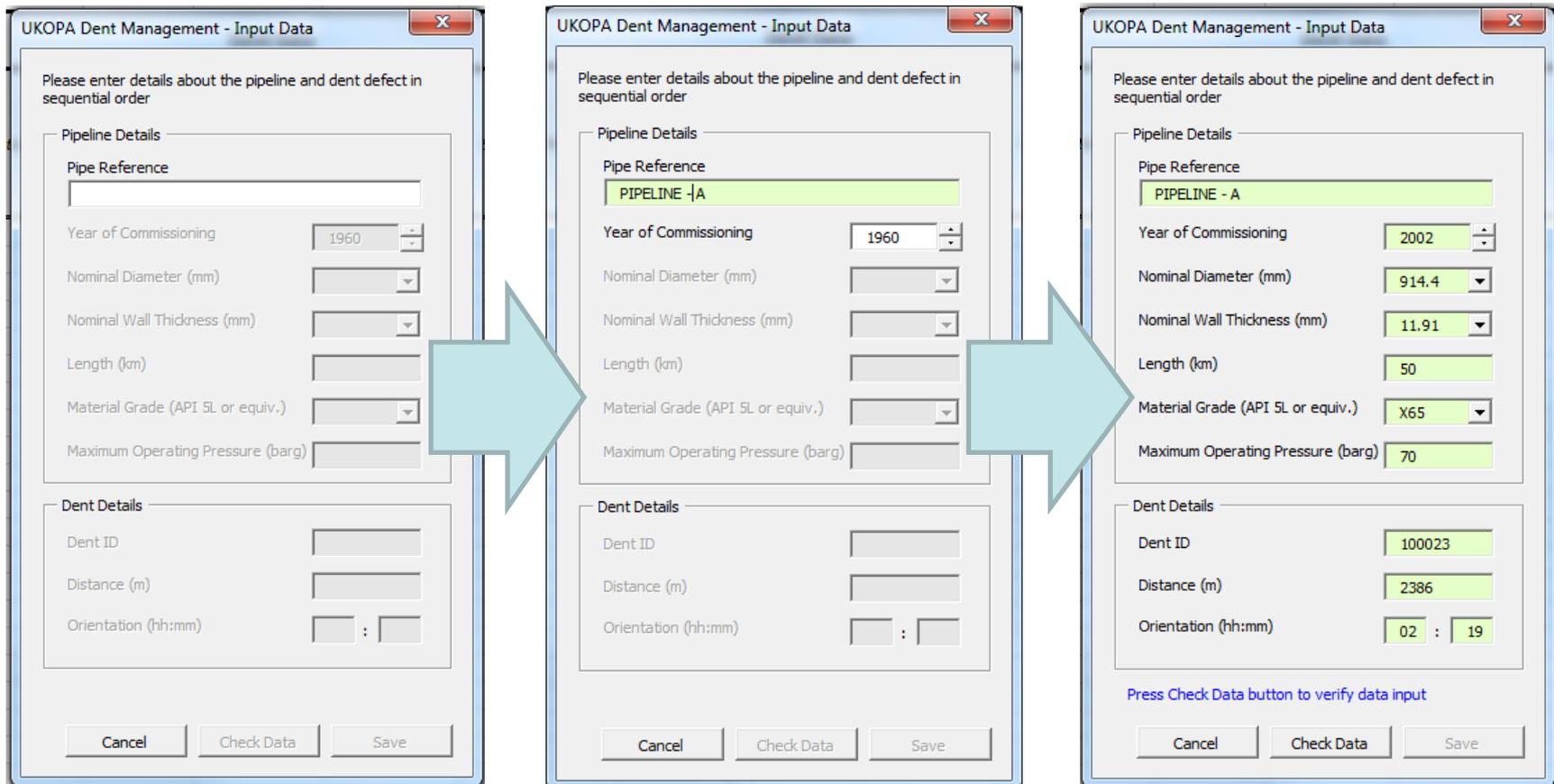- Set of rules allow rank dents by priority for repair based on cond.

Priority	Description	Action
1	Kinked dent	1
2	Unconstrained + associated with metal loss + associated with weld	1
3	Unconstrained + associated with metal loss (except corrosion less than 20% of wall thickness depth in grade X65 material or lower)	1
4	Unconstrained + associated with weld in 'Poor' quality category	1
5	Unconstrained + associated with weld in 'Probably good' category + depth≥2% or strain≥2%	1
6	Unconstrained + associated with weld in 'Known good' category + depth≥2% or strain≥4%	1
7	Unconstrained + evidence of external interference or coating damage from CIPS / DCVG	1
8	Constrained + associated with metal loss + associated with weld	1
9	Constrained + associated with metal loss (except corrosion less than 20% depth in grade X65 material or lower)	1
10	Constrained + associated with weld in 'Poor' quality category	1
11	Constrained + associated with weld in 'Probably good' category + depth≥2% or strain≥2%	1
12	Constrained + associated with weld in 'Known good' category + depth≥2% or strain≥4%	1
13	Constrained + evidence of external interference or coating damage from CIPS / DCVG	1
14	Unconstrained + depth≥7% or strain≥6%	1
15	Constrained + depth≥7% or strain≥6%	1
16	Unconstrained + predicted fatigue life exceeded (further prioritise dents within this priority level by predicted remaining fatigue life)	1
17	Constrained + predicted fatigue life exceeded (further prioritise dents within this priority level by predicted remaining fatigue life)	1

assigned

- Flow chart basis for Spreadsheet tool

2

Spreadsheet Tool – Manual Assessment

- ❑ How the tool is constructed and operated

- ❑ 2 assessments available, manual and automatic

- ❑ Blank Spreadsheet looks like this

- ❑ Spreadsheet shows column headers for data which will be filled

- ❑ The program run using command button on spreadsheet

Management Tool

UKOPA Dent Management Tool

Management Tool

									Dent Data						
Operator	Pipeline Reference	Year of Commissioning	Diameter (mm)	Wall Thickness (mm)	Length (km)	Material Grade	Operating Pressure (barg)		Dent ID Number	Distance (m)	Orientation (hh:mm)	Depth at Pressure (%OD)	Weld Quality	Strain (%)	Dep Asso Cor (%

Data Input

- ❑ Data entered in sequential order
- ❑ Check data button will help to avoid mistakes

Main Program – Flow Chart Algorithm

- ❑ Main part of program

- ❑ Based on flow chart from document

- ❑ Questions relating to assessment
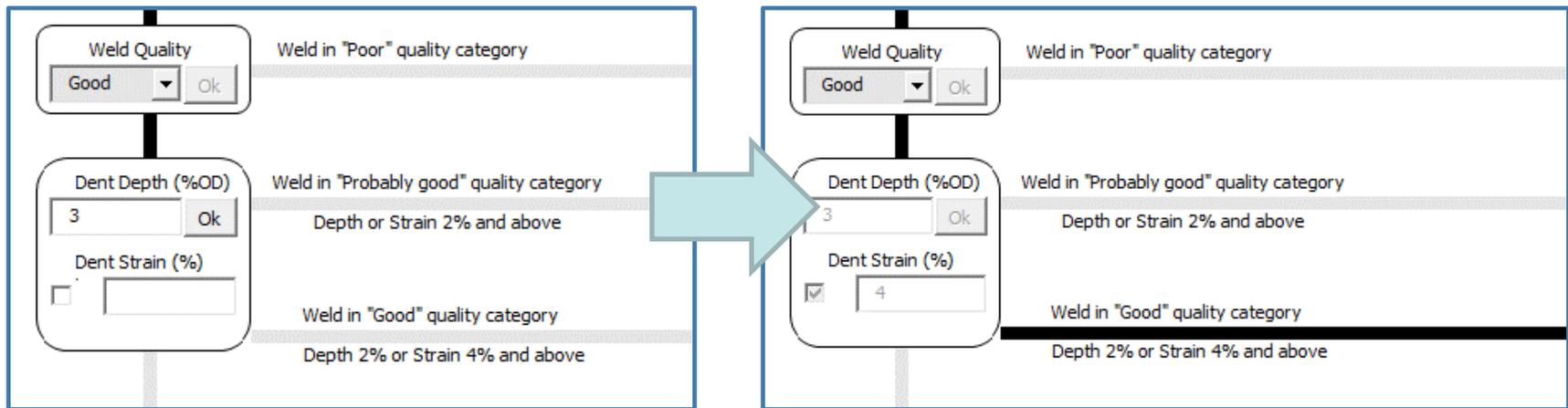
- ❑ Repair/Investigation Priority is set
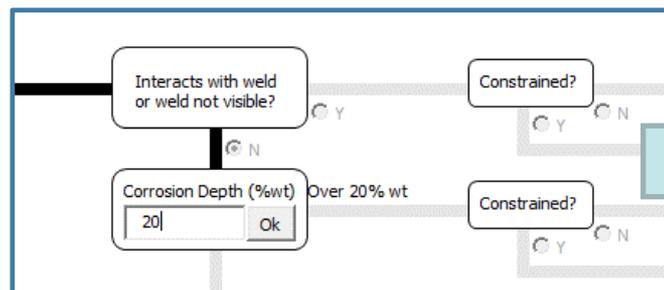
Flow Chart Selections

- Use Y/N controls to select correct data

- Follow chart through lines will shade progress

- Certain questions require more then Y/N answer e.g. weld type
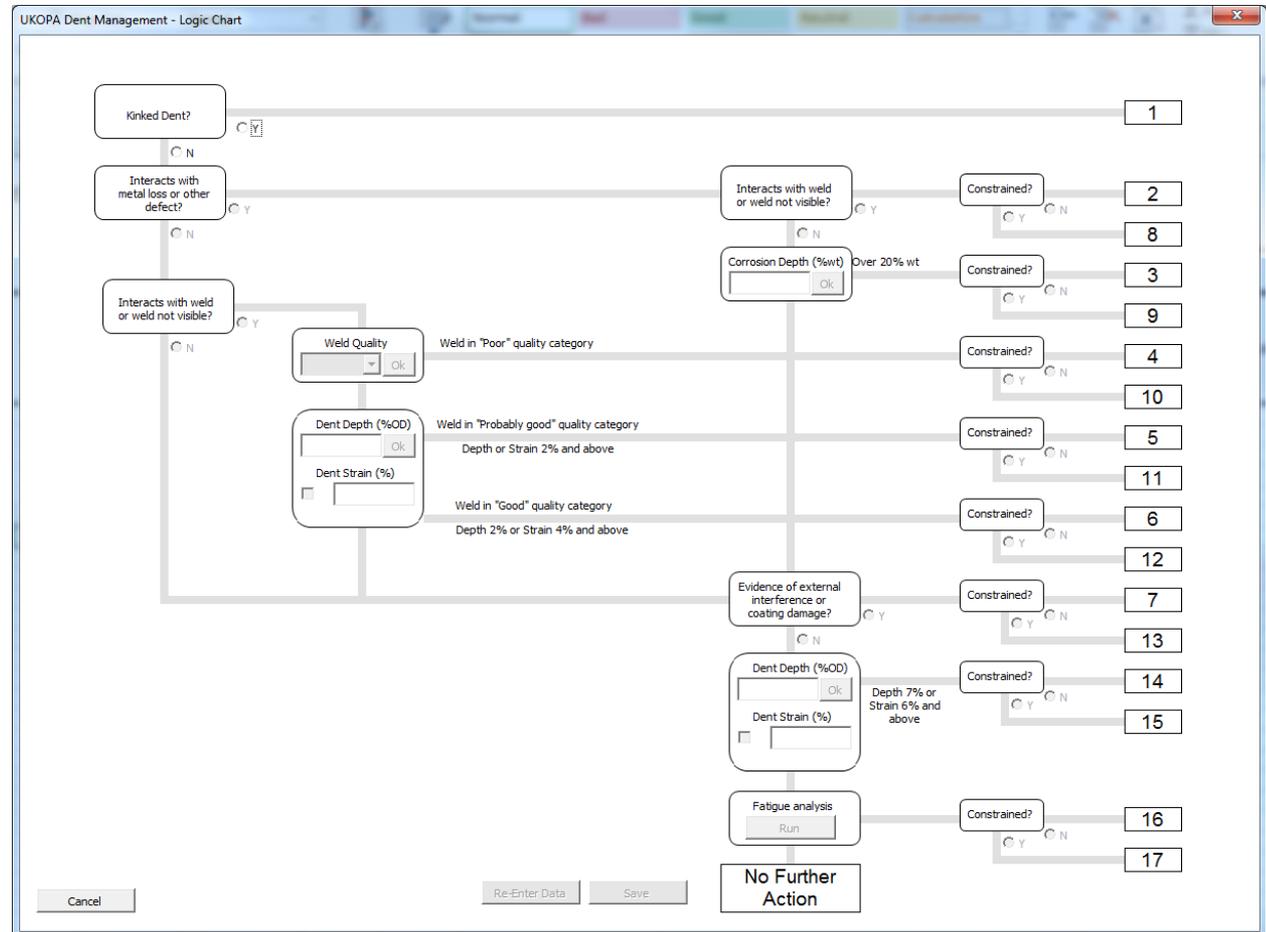
- Press re-enter data button to correct mistakes
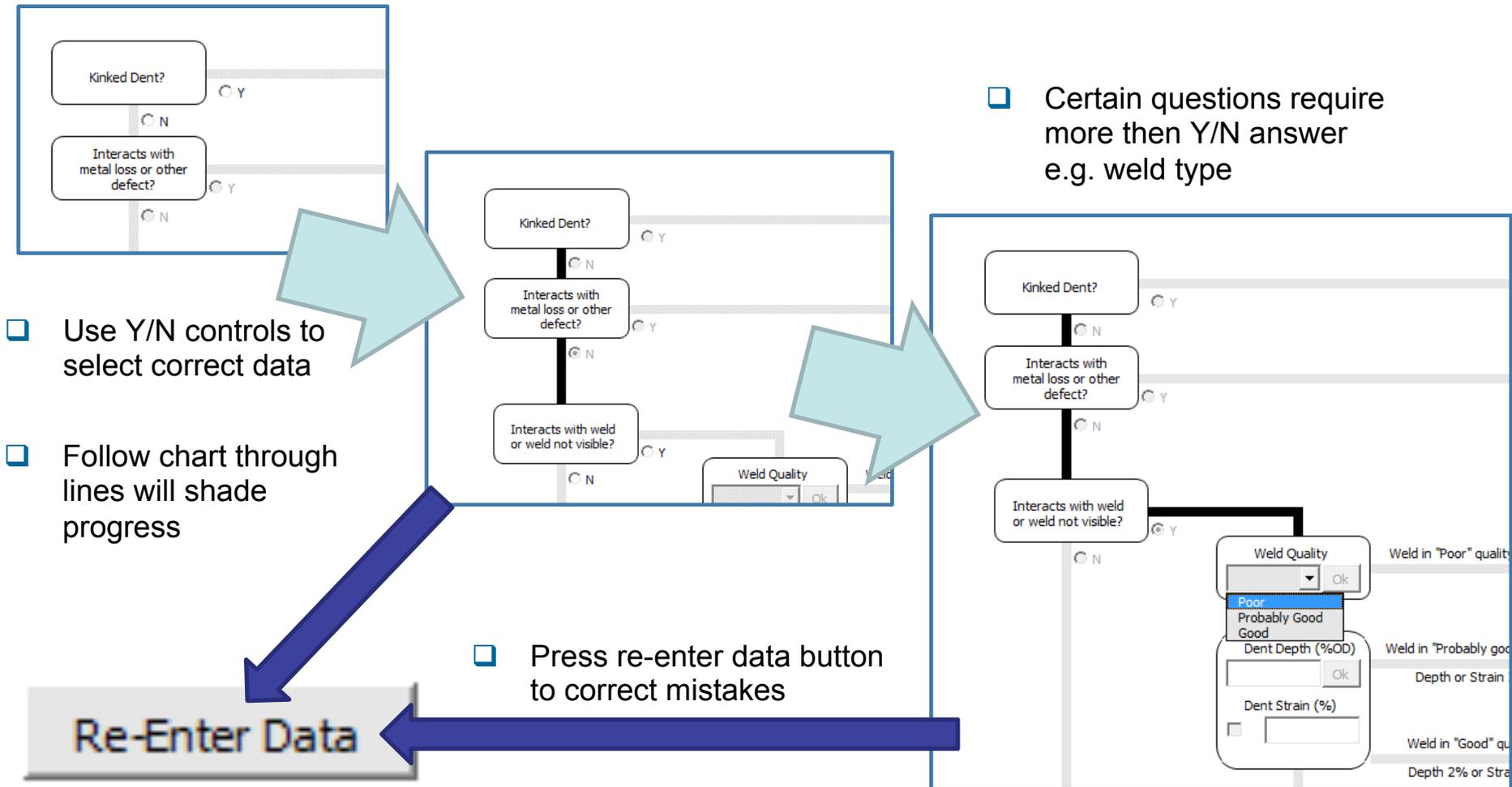
Flow Chart Selections

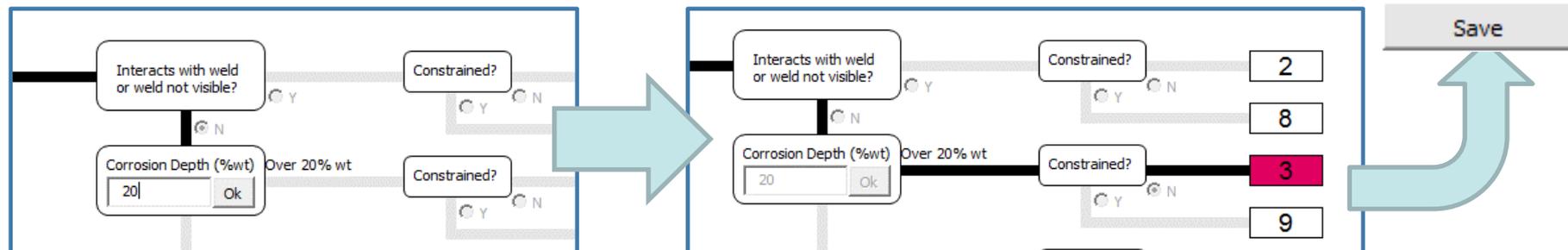
❑ Dent depth and strain
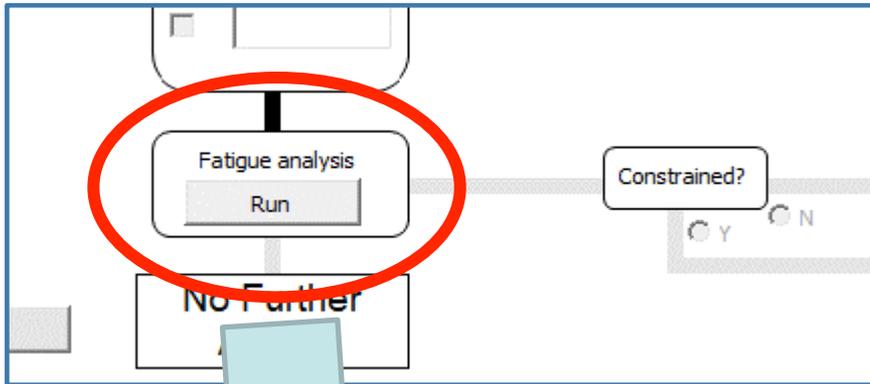

❑ Associated Corrosion Depth

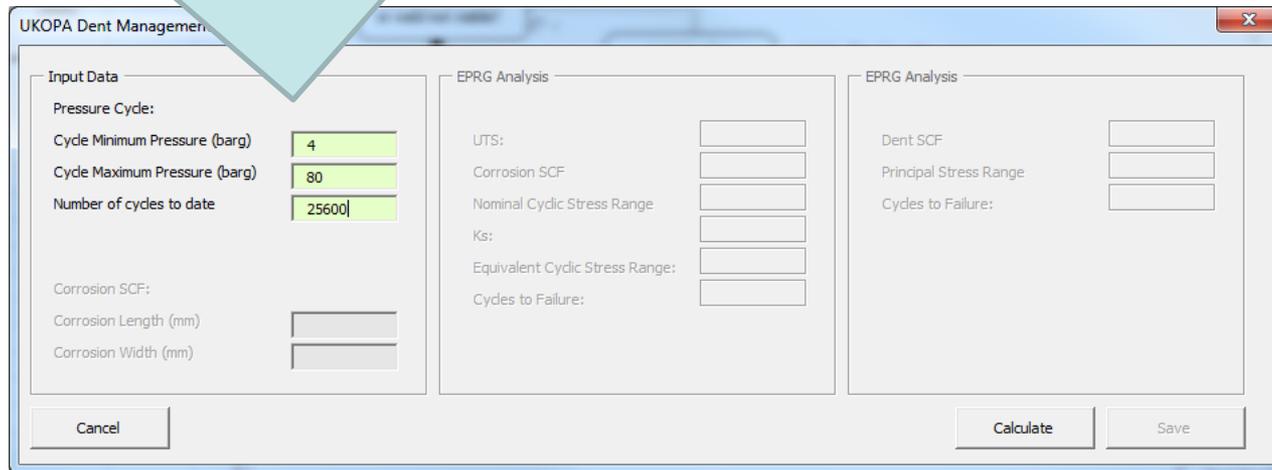❑ Once questions complete, priority is indicated in red

❑ Save Data to spreadsheet

Fatigue Analysis

- ❑ Certain set of choices end in the requirement of a dent fatigue analysis

- ❑ Run by clicking control button

- ❑ Enter cycle data in sequential order

- ❑ If dent has assoc. corrosion then a corrosion length + width will be requested

Fatigue Analysis

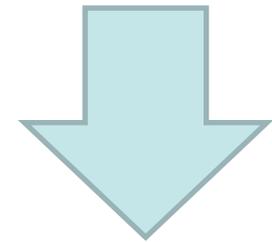- Fatigue life screened against EPRG Fatigue model

- Conservative fatigue life

- If fatigue life exceeded a dent SCF is calculated and a Class B S-N curve from BS 7608 used for more realistic fatigue life

Data Output

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
		UKOPA Dent Management Tool							Management Tool							
3												Dent Data				
4	Operator	Pipeline Reference	Year of Commissioning	Diameter (mm)	Wall Thickness (mm)	Length (km)	Material Grade	Operating Pressure (barg)		Dent ID Number	Distance (m)	Orientation (hh:mm)	Depth at Pressure (%OD)	Weld Quality	Strain (%)	Depth of Associated Corrosion (%wt)
5		PIPELINE - A	1905	914.4	11.91	90	X65	70		100023	2366	02:19	N/A	N/A	N/A	N/A
6		PIPELINE - B	1967	323.8	7.14	48	X52	34		269	2400	00:19	N/A	N/A	N/A	N/A
7		PIPELINE - C	1983	762	9.52	150	X60	67		14	7002	06:41	N/A	N/A	N/A	26
8		PIPELINE - D	1991	406.4	7.14	2.76	X65	31		10	1500	03:29	1	Good	N/A	N/A
9		PIPELINE - E	1971	168.3	5.56	11	X52	8		46	10902	07:48	5	N/A	N/A	N/A
10		PIPELINE - F	1987	406.4	8.74	88	X60	59		20945	24386	04:30	7	Probably Good	N/A	N/A

- ❑ Pipeline data and dent data columns filled based on input

- ❑ Questions from flow chart shown as shaded Y/N or N/A if answer not required

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN
	Kinked	Interacts with metal loss or other defects	Corrosion <20% wall thickness	Interacts with weld or weld not visible	Weld in "poor" category	Weld in "probably good" category	Depth <2% or strain <2%	Depth <2% or strain <4%	Evidence of external interference or coating damage?	Depth <7% or Strain <6%	Fatigue Analysis EPRG or FEA Life exceeded	Constrained?		Priority	
	No	No	N/A	No	N/A	N/A	N/A	N/A	Yes	N/A	N/A	Yes		13	
	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		1	
	No	Yes	No	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No		3	
	No	No	N/A	Yes	No	No	N/A	Yes	No	Yes	No	N/A		No Further Action	
	No	No	N/A	No	N/A	N/A	N/A	N/A	No	Yes	No	N/A		No Further Action	
	No	No	N/A	Yes	No	Yes	No	N/A	N/A	N/A	N/A	Yes		11	

- ❑ Last 2 columns give priority rating. A number is given and a data bar showing a visual representation

Spreadsheet Tool – Automatic Assessment

❑ Same assessment but use to assess many dents from in-line inspection data

❑ Enter pipeline data in boxes provided

❑ Boxes also available for pressure cycling data in case of fatigue assessment

Operator	NGN
Pipeline Reference	pipeline a
Diameter (mm)	168.3
Wall Thickness (mm)	7.14
Length (km)	150
Material Grade	X56
Operating Pressure (barg)	90
Year of Commissioning	2004
Weld Quality	Good

Data Type	Pressure
Cycle Min Value	4
Cycle Max Value	90
Cycle History	1200000
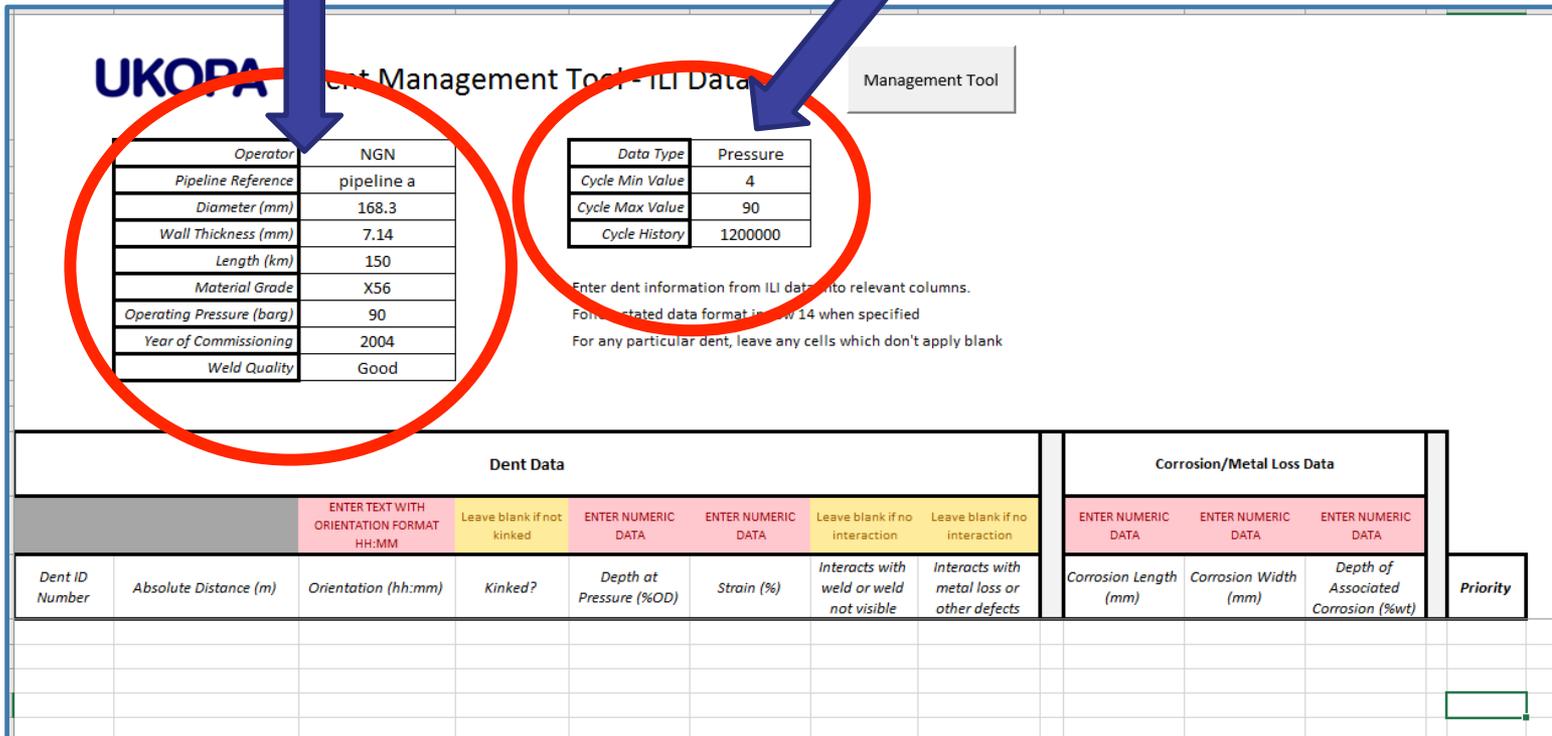
Management Tool

Enter dent information from ILI data into relevant columns.

Follow stated data format in row 14 when specified

For any particular dent, leave any cells which don't apply blank

		Dent Data							Corrosion/Metal Loss Data				
		ENTER TEXT WITH ORIENTATION FORMAT HH:MM	Leave blank if not kinked	ENTER NUMERIC DATA	ENTER NUMERIC DATA	Leave blank if no interaction	Leave blank if no interaction		ENTER NUMERIC DATA	ENTER NUMERIC DATA	ENTER NUMERIC DATA		
Dent ID Number	Absolute Distance (m)	Orientation (hh:mm)	Kinked?	Depth at Pressure (%OD)	Strain (%)	Interacts with weld or weld not visible	Interacts with metal loss or other defects		Corrosion Length (mm)	Corrosion Width (mm)	Depth of Associated Corrosion (%wt)		Priority

Spreadsheet Tool – ILI Assessment

- ❏ Paste in-line inspection data into relevant columns
- ❏ Written to accommodate different inspection data vendors
- ❏ Data should be in the format shown at top of column
- ❏ Any columns which don't apply – leave blank

- ❏ Results for all data written in priority column