Upstream Risk Management AS

gloryRCM
–
Industry standard tool suite for condition based maintenance of rotating equipment

The art of tough decision making

www.upsrm.com

Introduction

Study on subsea field maintenance (2010):

- “86% of maintenance is either too late (reactive) or too frequent (unnecessary preventive)”
- “63% of maintenance work orders resulted in no value-added work”

- **Q:**
  - **How can we help reduce cost and uncertainty related to critical asset rotating equipment failures?**

- **A:**
  - **Adopt the gloryRCM process as means to enable consistent validation of your asset maintenance plans**

gloryRCM – Process

- 1. Significant item identification and screening
  - “System failure analysis”. Global impacts related to system state and configuration.
- 2. FMECA
  - “Component failure analysis”. Local- and system impacts of failures.
- 3. Critical maintenance task selection
  - “Predictive maintenance task selection based on operating conditions”
  - “Preventive maintenance task selection”
  - “Run to failure” (corrective maintenance only)
- 4. Predictive maintenance interval optimisation (condition based)
- 5. Preventive maintenance interval optimisation (age based)
- 6. Spare parts optimisation
  - “Fast moving spares”
  - “Slow moving spares”’
  - “Rotables spares”

gloryRCM – Steps 1&2

- 1. Significant item identification
  - "System failure analysis"

Significant Item Identification

					Failure of item compromises:				Redundancy status				
id	Item	Operational mode	Function	Function require-ments	HSE	Production Volume	Product Quality	Maintenance cost	No redundancy exists	Partial redundancy exists	Full redundancy exists	Conse-quence class, Priority: 1-7	Item significant or insignificant
1		Running			1				1			1	Significant
2		Start-up										7	Insignificant
3		Testing					1		1			3	Significant
4		Idle			1	1	1	1			1	6	Significant
5		Standby						1	1			4	Significant
6						1			1			2	Significant
7					1	1	1	1		1		5	Significant

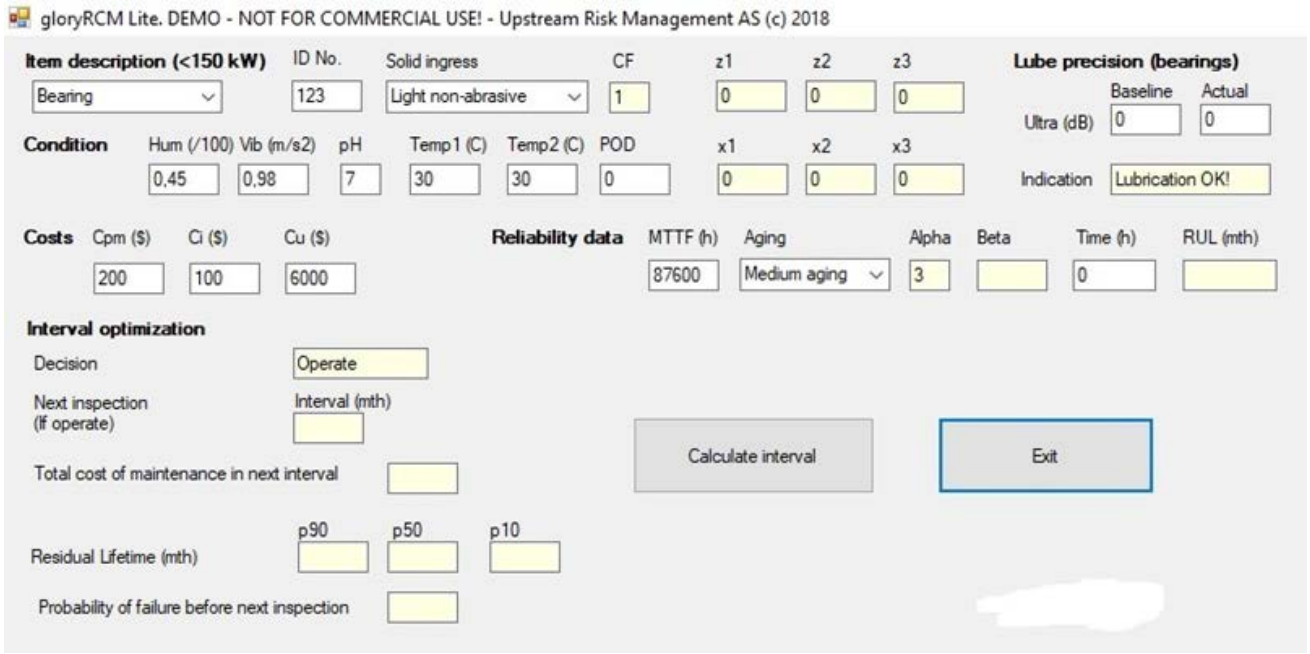
- 2. FMECA
  - "Component failure analysis".

Criticality Decision Matrix

Failure Modes, Effects and						Failure Effect Classification					Frequency					Criticality Analysis		
id	Item	Function	Failure mode	Failure Effect	Failure rate	HSE	Production Volume	Product Quality	Maintenance Cost	Severity	1/1000 year	1/100 year	1/10 year	1/year	>= 1/month	Severity	Frequency	Criticality decision
											Very Unlikely	Remote	Occasional	Probable	Frequent			
											1	2	3	4	5			
1						Massive Impact	Massive Impact	Massive Impact	Massive Impact	5					H	5	3	
6						Major Impact	Major Impact	Major Impact	Major Impact	4						4	1	
3																3	4	
5						Moderate Impact	Moderate Impact	Moderate Impact	Moderate Impact	3			M			2	5	
7																1	2	
4						Minor Impact	Minor Impact	Minor Impact	Minor Impact	2		L				0	3	
						Slight Impact	Slight Impact	Slight Impact	Slight Impact	1								
						No Impact	No Impact	No Impact	No Impact	0								

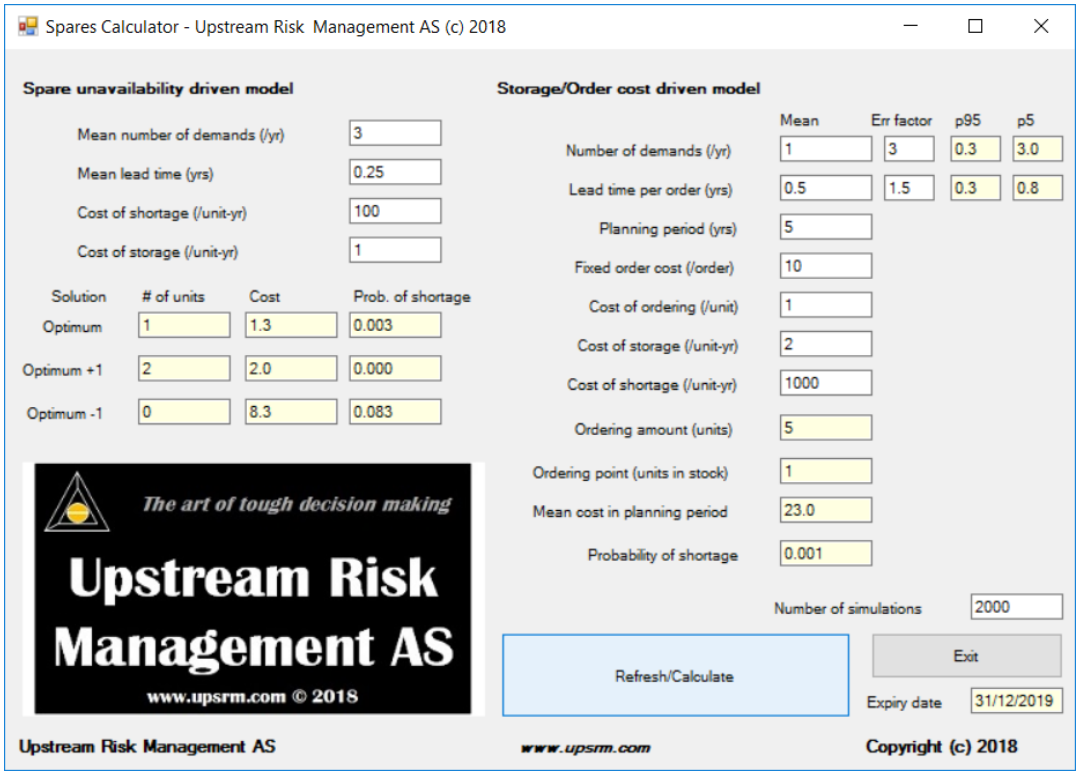
gloryRCM – Steps 3&4

- 3. Critical maintenance task selection
  - “Predictive maintenance task selection” / “Preventive maintenance task selection” / “Run to failure”
- 4. Predictive maintenance optimisation (condition/inspection based)



gloryRCM – Steps 5&6

- 5. Preventive maintenance optimisation (age based)
- 6. Spare parts optimisation



gloryRCM – Benefits

- Ability to determine probability of system failure during the next *x* months
  - RUL(s) provided
- Ability to skip some scheduled inspections. What are risks involved?
  - Criticality informed task selection provided
- Ability to decide about postponing a maintenance task to next maintenance window. What are risks involved?
  - Criticality informed task selection provided
  - Grouping results provided
- Ability to decide what components should be prioritised if several require maintenance
  - Significant item identification and screening

Summary

How to reduce cost and uncertainty related to maintenance management of rotating equipment?

- Upstream Risk Management suggest you adopt the gloryRCM tool to consistently validate your asset maintenance plans
  - Your field-specific expertise, experience data and conditions coupled to;
  - State-of-art probabilistic component degradation and maintenance models

- Benefits:

Consistent solution for identifying the most cost-effective condition based maintenance plan!

Upstream Risk Management AS

- Are you willing to spend billions of dollars on something without making sure it performs?
- We offer you the ability to quantify complex asset risks
  - Safety and Maintenance cost
  - Operating expenses and Production losses
- Our vision is to provide all key metrics for tough decision making in asset management
  - Products and services based on solutions developed with clients in the field

The art of tough decision making

www.upsrm.com