

RBI: CASE STUDY



OPTIMIZE TURNAROUND BUNDLE SCOPE USING BUNDLE RBI

Bundle Risk-Based Inspection (RBI) methodology evaluates the consequence of failure (COF) and probability of failure (POF) to determine an overall financial risk. The POF of bundle RBI is calculated by comparing similar service bundles to determine a characteristic bundle life. The COF of bundle RBI considers the costs that would incur given a bundle failure. The COF calculation considers production and environmental impacts and bundle replacement costs. By comparing the risk of a bundle to an acceptable financial risk limit, an inspection plan can be developed to optimize turnaround (TA) activities, including bundle replacement and inspection.

PROBLEM

A petroleum facility requested that E²G | The Equity Engineering Group, Inc. perform a bundle RBI analysis and create an inspection plan to help optimize their TA scope. The analysis goal was to determine the risk of each bundle and outline which bundles needed inspection/replacement based on acceptable risk limits.

CALCULATION BACKGROUND

- The Bundle RBI methodology determines the risk at various times in the future. Critical dates considered are the RBI Date and the 1st and 2nd upcoming TAs.
- Risk is compared to an acceptable risk target. If the risk exceeds this target, an inspection/replacement is recommended.

BENEFITS TO THE CLIENT

The main benefit and final product of an RBI assessment is an inspection plan that highlights inspection/replacement activity. An excerpt of the inspection plan created for the client along with observations can be seen on the next page.

Additional benefits for completing an RBI Bundle analysis include the following:

Avoid unexpected downtime and associated loss of production

Gain knowledge on bundle deterioration and anticipated bundle life

Make economic decisions on replacement (in-kind/upgrade) vs. inspection

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BUNDLE RBI ANALYSIS

EXCHANGER ID	EXCHANGER DESCRIPTION	BUNDLE MATERIAL	PRODUCTION IMPACT	RISK				ACTION ¹	ACTION TIMEFRAME
				RBI DATE	ACCEPTABLE RISK		2 ND TA W/ INSP		
					1 ST TA	2 ND TA			
X-001	LGO/HGO Exchanger	Carbon Steel	20% Rate Reduction	97%	100%	119%	82%	B	1 st - 2 nd TA
X-002	Depropanizer OVHD Condenser	Carbon Steel	20% Rate Reduction	0%	1%	16%	16%	None	---
X-003	Slurry Product Cooler	Carbon Steel	20% Rate Reduction	0%	132%	133%	133%	A Re-tube	NAO ² - 1 st TA
X-004	Slurry Steam Generator	5Cr	20% Rate Reduction	107%	121%	134%	95%	A	NAO ² - 1 st TA
X-005	1 st Stage Compressor Cooler	Admiralty Brass	20% Rate Reduction	160%	165%	165%	165%	A Re-tube	NAO ²
X-006	Lube Oil Cooler	Admiralty Brass	Bypass	38%	47%	56%	56%	None	---

¹Grades represent the level of effectiveness required for inspection

²NAO – Next Available Opportunity

TABLE OBSERVATIONS

- Inspecting X-003 and X-005 would not decrease the risk enough to extend the bundle life to the 2nd TA. This is because X-003 and X-005 will be near their end of life at the 1st TA. Replacing these bundles is recommended.
- Inspecting X-001 and X-004 will decrease the risk enough to extend the bundle life to the 2nd TA. Inspecting these bundles is recommended.
- X-002 and X-006 do not require inspection before the 2nd TA.
- The risk of X-004 becomes unacceptable before the 1st TA. Replacement/inspection should be completed at the next available opportunity – but no later than the 1st TA.
- The risk of X-001 becomes unacceptable before the 2nd TA. Inspection should be completed between the 1st and 2nd TA.

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