

A refinery & petrochemical plant extension project in Saudi Arabia required to establish the equipment criticality ranking in order to prioritise maintenance and spare resources before commissioning.

This project has large amount of equipment but required to be completed in a very short period and with limited site personnel resource. ProAIM's streamlined equipment criticality assessment was just the right tool to be used to achieve this target.



BENEFITS

ProAIM was able to complete the assessment within the short schedule period with minimum site personnel involvement. The results were satisfied and fully accepted by the client. Key critical equipment was identified aligned with site expectations. The results will form a solid basis of client's maintenance strategies establishment.

SCOPE

The project only took 16 weeks to complete. A total of nearly 60,000 tagged equipment, including mechanical, electrical and instrument, were assessed and specified criticality level.

METHODOLOGY

Traditional Equipment Criticality Assessment (ECA) is qualitative basis and heavily relied on individual subject matter expert's knowledge and experience to achieve results. It was mainly performed in workshop facilitation process which required a lot of time and personnel resources from the client. ProAIM's streamlined ECA fully utilises the quantitative element in client's historical data. It provides quick and accurate screening ECA results especially involving large amount of equipment.

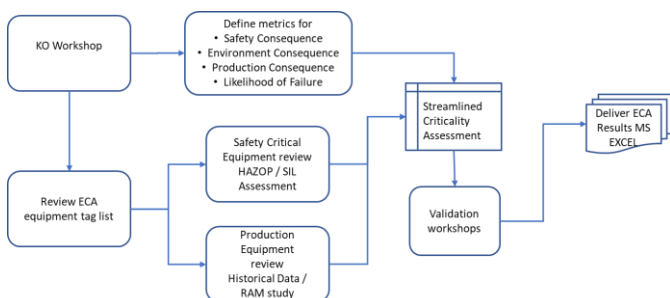
ABOUT PROAIM

A reliability-engineering consultancy company based in the UK, with operations across the globe.

Providing specialist bespoke consultancy with integrated RAM technology and training solutions in the area of reliability and maintenance engineering.

We enable our clients in asset-centric process industries to achieve the safety, production output and costs targets for their business.

ProAIM is one of the leading companies able to quantify the true life-cycle costs from design to decommissioning by combining RAM and Process Synthesis with ProAIM's patented RAM-int.



PROCESS

1. Define Criticality Metrics:

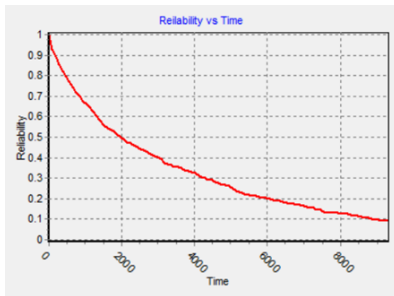
- Criticality levels of equipment failure consequence and likelihood.
- Criticality Matrix.

Frequency	Rating
> 1 – 3 years	Frequent
> 3 – 5 years	Most Likely
> 5 – 10 years	Likely
> 10 – 25 years	Less Likely

Safety	Environment	Financial	Rating
Multiple fatalities to workers and/or impact on third parties	Impact that is unconfined over large public area and requiring long-term recovery, leaving major residual damage	Cost is > \$100m - \$250m	Catastrophic
Single fatality to worker and/or severe irreversible damage to one or more person.	Impact that is unconfined and requiring long-term recovery, leaving residual damage	Cost is > \$50m - \$100m	Major
Reversible injuries requiring medical treatment	Near-source confined and short-term reversible impact	Cost is > \$25m - \$50m	Minor
Short term inconvenience i.e. First Aid	Near-source confined and promptly reversible impact	Cost is > \$100,000m - \$25m	Insignificant

Probability	Criticality Class (Risk Rank)			
	C	C	B	A
Frequent	C	C	B	A
Most Likely	C	C	C	B
Likely	D	C	C	C
Less Likely	D	D	C	C
Consequence	Insignificant	Minor	Major	Catastrophic

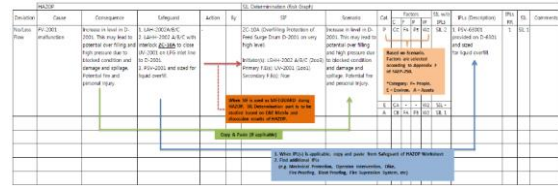
2. Utilise client historical data or existing RAM study to determine equipment likelihood of failure and financial impact.



Product	Sales (20 years)	Average Annual Revenue
No.1	\$2.6B	\$130M
No.2	\$3.7B	\$185M
No.3	\$1.6B	\$83M
No.4	\$6.1B	\$300M
No.5	\$4.6B	\$230M
No.6	\$8.8B	\$450M
No.7	\$6.1B	\$300M
No.8	\$0.5B	\$23M
No.9	\$3.1B	\$150M
No.10	\$1.2B	\$75M
Sales	\$38.3B	\$1,926M

3. Utilise client's existing HAZOP / SIL study reports to determine equipment safety & environmental consequence.

Consequence	Description
C _A	<ul style="list-style-type: none"> • People: Employee injury or damage to health. • Environment: Minor and inside the fence. • Assets: Minor damage. Cost less than \$1 million.
C _B	<ul style="list-style-type: none"> • People: Employee fatality. • Environment: Localized effect affecting neighborhood. • Assets: Partial shutdown. Cost up to \$100 million.
C _C	<ul style="list-style-type: none"> • People: Employee multiple fatalities and some impact on third parties. • Environment: Severe damage to environment to be extensively restored by SA. • Assets: Partial operation loss. Costs up to \$500 million.
C _D	<ul style="list-style-type: none"> • People: Employees and third parties multiple fatalities. • Environment: Contamination over a public large area. Major economic loss to SA. • Assets: Significant or total loss of facility. Costs above \$500 million.



4. Identified Criticality Ranking to be validated with clients in workshops

- First equipment criticality screening results were delivered (including most critical equipment identification)
- Results were validated with client's site personnel in the workshop.
- Updates / modifications were made to be final issued

Asset tag number	Equipment	Plants	Equipment criticality assessment CRITERIAS		Equipment criticality classes
	Descriptions		Name	Probability	
TEL-101	TELECOMMUNICATION PANEL TEL-101	Utilities	Less Likely	Minor	D
SRU-0002	SRU REMOVAL UNIT SRU-0002	Utilities	Less Likely	Minor	D
SS-RIO-201	REMOTE I/O CABINET SS-RIO-201	Utilities	Less Likely	Major	C
SS-ADC-201	SS MARSHALLING CABINET SS-ADC-201	Utilities	Less Likely	Major	C
PCS-PDP-701	PCS POWER DISTRIBUTION PANEL PCS-PDP-701	Utilities	Less Likely	Minor	D
PCS-ITP-701	INTERMEDIATE TERMINAL PANEL PCS-ITP-701	Utilities	Less Likely	Minor	D
PCS-IRP-702	INTERPOSING RELAY PANEL PCS-IRP-702	Utilities	Less Likely	Minor	D
PCS-IRP-701	INTERPOSING RELAY PANEL PCS-IRP-701	Utilities	Less Likely	Minor	D
PCS-FOC-701	PCS FIBER OPTIC CABINET PCS-FOC-701	Utilities	Less Likely	Minor	D
HUM-0001	HUMIDIFIER HUM-0001	Utilities	Less Likely	Minor	D
FMS-SC-806	FMS CABINET FMS-SC-806	Utilities	Less Likely	Minor	D
FMS-SC-805	FMS CABINET FMS-SC-805	Utilities	Less Likely	Minor	D
FMS-SC-804	FMS CABINET FMS-SC-804	Utilities	Less Likely	Minor	D
FMS-SC-803	FMS CABINET FMS-SC-803	Utilities	Less Likely	Minor	D
FMS-SC-802	FMS CABINET FMS-SC-802	Utilities	Less Likely	Minor	D
FMS-SC-801	FMS CABINET FMS-SC-801	Utilities	Less Likely	Minor	D
FGAS-RIO-301	FIRE&GAS REMOTE I/O CABINET FGAS-RIO-301	Utilities	Less Likely	Major	C