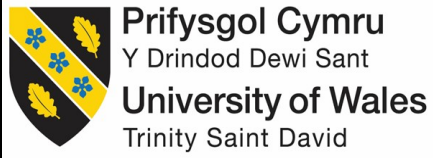


The Design and Implementation of an Equipment Reliability Strategy on a Conical Twin-Screw Mixer at Dow Silicones

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Background

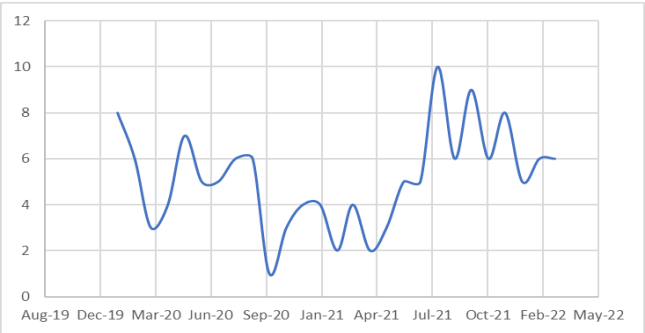
Since installation as MET in 2018, the CTM has only been maintained on a breakdown basis. This has lead to extremely poor reliability performance. To improve this, an equipment reliability strategy is required to determine the most effective means of maintaining the equipment. This project will aim to achieve the optimum level of reliability, whilst considering the cost implications, through addressing and eliminating root causes of failures and reducing impacts of those that cant be removed.

Management of Spares

All parts identified in the FMEA findings have been designated either stores stock, vendor shelved or no part held. This decision was made based on the cost of the item, the likely hood of failure or whether it is a consumable part from any defined planned work. Stock levels to be held have been determined through analysing lead times against MTBF or planned replacements and the impact of not having the part when needed. All stores stock items will be automatically ordered as part of a min-max replenishment system.

Reliability Analytics

Metric of comparison used based on the literature available will be MTBF. Current MTBF since installa-tion has averaged 6 days, with a monthly low of 3.9 and a high of 30 days. This has resulted in at least £85,000 of maintenance costs.



Management of Change

Ensuring the transition to the new strategy is done with the whole team working towards the same goal is imperative to the project’s success. To do this the mindset of the team needs to change from a reactive approach, to a proactive strategy, where operations will have to release machinery for planned outages and maintenance will have to become akin to completing work that may be deemed by them non-value adding. Lewin’s 3 step theory of ‘Unfreeze, Change and Refreeze’ will be utilised to help drive this change.

Maintenance Strategy

Using the FMEA, differing approaches were given to each failure mode of the equipment. Preventative work will be carried out on those parts which deteri-oration cant be seen. If detection is possible then a condition based approach was taken to monitor the deterioration. These jobs were grouped in to yearly outages, as per the findings of voice of the customer study carried out.

Component	Sub-Component	Component / Sub-component function	Failure Mode	Failure Mechanism	Documentation	Severity	Detection	RPN	Rec. Strategy
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Insufficient lubrication or oil contamination (low/high viscosity, moisture, dirt / foreign particles)	2	3	3	18	Predictive
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Installation error	2	3	3	18	Failure elimination
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Poor fit (shaft / housing fit, wrong bearing / shaft)	3	3	2	18	Failure elimination
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Poor lubrication (low/high viscosity, missing greases, low/high level)	2	3	3	18	Failure elimination
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Shaft deflection / misalignment	1	3	3	9	Predictive
Gear Box (Primary) mounted to Main Motor & Screw driving gear box	Gear Box - Drivings	Support shaft rotation and keep shaft in the same axis	Bearing- flaking, spalling, skidding, excessive wear, pitted	Excessive or fluctuating load	2	3	3	18	Failure elimination

Improvement Opportunities

The current means of recording reliability data groups breakdown and planned outages as being equally impactful to production hence true comparisons before and after cant be drawn. Moving towards an OEE style of recording would allow much more definite comparisons to be drawn.