| Criticality ranking | Failure Cause code | Possible cause of the failure (Failure Mode) | Effects on hydraulic & Mechanical operating parameters | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Q (M3/hr) | No liquid delivery | Pd (kg/cm2) | NPSHR (m) | Pm (kw)/Ct (amps) | h (%) | Change in Vibration | Vib. Signature, l (mm/s) | Spike energy, gSE | Noise, dB | Mech. Seal leakage | TP (0C) | TB(oC) | TMoC | Disc. Cntrl. Vlv. Opening (%) | Average Deviation |
| FC1 | **FM21** | **Worn wearing ring** | **(-)** |  | **(--)** | **NC** | **(++)** | **(--)** | **yes** | **1. Peak at Vane pass freq.** | **(+)** | **NC** |  | **NC** | **NC** |  | **(++)** |  |
|  | | SV of parameters | 57.7 | - | 54.6 |  | 17 | 60 | - | 2.8 | 0.5 | - |  | 260 | 70 | - | 35 |  |
| 1st. Threshold values of parameters | 54.8 | - | 47 |  | 18 | 53 | - | 4.5 | 2.5 | - |  | 260 | 70 | - | 45 | 0.8679 |
| Deviation (in %) of 1st Threshold value | 5% | - | 14% |  | 6% | 12% | - | 61% | 400% |  |  | 0% | 0% | - | 29% |
| 2nd. Threshold value | 54.8 | - | 42 |  | 19 | 40 | - | 4.6 | 3 | - |  | 260 | 70 | - | 60 | 1.1731 |
| Deviation (in %) of 2nd Threshold value | 5% | - | 23% |  | 12% | 33% | - | 64% | 500% | - |  | 0% | 0% | - | 71% |
| FC2 | **FM22** | **Worn, rusted defective bearing** | **NC** | **-** | **NC** | **NC** | **(++)** | **NC** | **yes** | **1. Dominant peak at Bearing defect freq.** | **(++)** | **(++)** |  | **NC** | **(++)** | **NC** | **NC** |  |
|  | | SV of parameters |  | - |  |  | 17 |  |  | 2.8 | 0.5 |  |  |  | 70 |  |  |  |
| 1st. Threshold values of parameters |  | - |  |  | 18 |  |  | 4.5 | 2.5 |  |  |  | 80 |  |  | 1.2022 |
| Deviation (in %) of 1st Threshold value |  | - |  |  | 6% |  |  | 61% | 400% |  |  |  | 14% |  |  |
| 2nd. Threshold value |  | - |  |  | 19 |  |  | 4.6 | 3 |  |  |  | 90 |  |  | 1.5116 |
| Deviation (in %) of 2nd Threshold value |  | - |  |  | 12% |  |  | 64% | 500% |  |  |  | 29% |  |  |
| FC3 | **FM19** | **Starvation at Pump suction/Insufficient suction volume** | **(--)** |  | **(--)** | **NC** | **(--)** | **NC** | **yes** | **1. Peak at Vane pass freq.** | **(++)** | **(++)** |  | **(+)** | **(++)** |  | **(++)** |  |
|  | | SV of parameters | 57.7 |  | 54.6 |  | 17 |  |  | 2.8 | 0.5 |  |  | 260 | 70 |  | 35 |  |
| 1st. Threshold values of parameters | 54.8 |  | 47 |  | 15 |  |  | 4.5 | 2.5 |  |  | 300 | 80 |  | 45 | 0.7781 |
| Deviation (in %) of 1st Threshold value | 5% |  | 14% |  | 12% |  |  | 61% | 400% |  |  | 15% | 14% |  | 29% |
| 2nd. Threshold value | 54.8 |  | 42 |  | 15 |  |  | 4.6 | 3 |  |  | 320 | 90 |  | 60 | 1.0317 |
| Deviation (in %) of 2nd Threshold value | 5% |  | 23% |  | 12% |  |  | 64% | 500% |  |  | 23% | 29% |  | 71% |
| FC4 | **FM12** | **Internal rubbing** | **NC** |  | **NC** | **NC** | **(++)** | **NC** | **yes** | **1. Multiple harmonics at 1X. 2. 0.5X, 0.33X harmonics.** | **(++)** | **(+)** |  | **(++)** | **NC** | **NC** |  |  |
|  | | SV of parameters |  |  |  |  | 17 |  |  | 2.8 | 0.5 |  |  | 260 |  |  |  |  |
| 1st. Threshold values of parameters |  |  |  |  | 18 |  |  | 4.5 | 2.5 |  |  | 300 |  |  |  | 1.2050 |
| Deviation (in %) of 1st Threshold value |  |  |  |  | 6% |  |  | 61% | 400% |  |  | 15% |  |  |  |
| 2nd. Threshold value |  |  |  |  | 19 |  |  | 4.6 | 3 |  |  | 320 |  |  |  | 1.4978 |
| Deviation (in %) of 2nd Threshold value |  |  |  |  | 12% |  |  | 64% | 500% |  |  | 23% |  |  |  |
| FC5 | **FM16** | **NPSHA < NPSHR** | **(-)** |  | **(-)** | **NC** | **NC** | **NC** | **yes** | **1. Peak at Vane pass freq.** | **(++)** | **(++)** |  | **(+)** | **(+)** |  | **(++)** |  |
|  | | SV of parameters | 57.7 |  | 54.6 |  |  |  |  | 2.8 | 0.5 |  |  | 260 | 70 |  | 35 |  |
| 1st. Threshold values of parameters | 54.8 |  | 47 |  |  |  |  | 4.5 | 2.5 |  |  | 300 | 80 |  | 45 | 0.8881 |
| Deviation (in %) of 1st Threshold value | 5% |  | 14% |  |  |  |  | 61% | 400% |  |  | 15% | 14% |  | 29% |
| 2nd. Threshold value | 54.8 |  | 42 |  |  |  |  | 4.6 | 3 |  |  | 320 | 90 |  | 60 | 1.1841 |
| Deviation (in %) of 2nd Threshold value | 5% |  | 23% |  |  |  |  | 64% | 500% |  |  | 23% | 29% |  | 71% |
| FC6 | **FM26** | **Discharge Cavitation (Pump operating at lower capacity)** | **(---)** | **NC** | **(++)** | **(--)** | **(--)** | **NC** | **yes** | **1. Peak at Vane pass freq.** | **(++)** | **(++)** |  | **(++)** | **(+)** |  | **(-)** |  |
|  | | SV of parameters | 57.7 |  | 54.6 | 4.1 | 17 |  |  | 2.8 | 0.5 |  |  | 260 | 70 |  | 35 |  |
| 1st. Threshold values of parameters | 21 |  | 58 | 3.8 | 13 |  |  | 4.5 | 2.5 |  |  | 300 | 80 |  | 20 | 0.7044 |
| Deviation (in %) of 1st Threshold value | 64% |  | 6% | 7% | 24% |  |  | 61% | 400% |  |  | 15% | 14% |  | 43% |
| 2nd. Threshold value | 21 |  | 58 | 3.8 | 13 |  |  | 4.6 | 3 |  |  | 320 | 90 |  | 20 | 0.8439 |
| Deviation (in %) of 2nd Threshold value | 64% |  | 6% | 7% | 24% |  |  | 64% | 500% |  |  | 23% | 29% |  | 43% |
| FC7 | **FM20** | **Worn Impeller** | **(--)** |  | **(--)** | **NC** | **(-)** | **(--)** | **yes** | **1. Peak at Vane Pass Freq.** |  | **(++)** |  | **NC** | **NC** | **NC** | **(++)** |  |
|  | | SV of parameters | 57.7 |  | 54.6 |  | 17 | 60 |  | 2.8 | 0.5 |  |  |  |  |  | 35 |  |
| 1st. Threshold values of parameters | 54.8 |  | 47 |  | 15 | 53 |  | 4.5 | 2.5 |  |  |  |  |  | 45 | 0.7595 |
| Deviation (in %) of 1st Threshold value | 5% |  | 14% |  | 12% | 12% |  | 61% | 400% |  |  |  |  |  | 29% |
| 2nd. Threshold value | 54.8 |  | 42 |  | 15 | 40 |  | 4.6 | 3 |  |  |  |  |  | 60 | 1.0127 |
| Deviation (in %) of 2nd Threshold value | 5% |  | 23% |  | 12% | 33% |  | 64% | 500% |  |  |  |  |  | 71% |
| FC8 | **FM25** | **Hydraulic instability** | **NC** |  | **NC** | **NC** | **NC** | **NC** | **yes** | **1. Peak at Vane pass freq.** |  | **(++)** |  |  | **(++)** |  |  |  |
|  | | SV of parameters |  |  |  |  |  |  |  | 2.8 |  |  |  |  | 70 |  |  |  |
| 1st. Threshold values of parameters |  |  |  |  |  |  |  | 4.5 |  |  |  |  | 80 |  |  | 0.3750 |
| Deviation (in %) of 1st Threshold value |  |  |  |  |  |  |  | 61% |  |  |  |  | 14% |  |  |
| 2nd. Threshold value |  |  |  |  |  |  |  | 4.6 |  |  |  |  | 90 |  |  | 0.4643 |
| Deviation (in %) of 2nd Threshold value |  |  |  |  |  |  |  | 64% |  |  |  |  | 29% |  |  |
| FC9 | **FM15** | **Misalignment(Pump-driver)** | **NC** | **NC** | **NC** | **NC** | **(++)** | **NC** | **yes** | **1. Dominant peak at 2X.** |  | **NC** |  | **(++)** | **(++)** | **NC** |  |  |
|  | | SV of parameters |  |  |  |  | 17 |  |  | 2.8 |  |  |  | 260 | 70 |  |  |  |
| 1st. Threshold values of parameters |  |  |  |  | 18 |  |  | 4.5 |  |  |  | 300 | 80 |  |  | 0.3209 |
| Deviation (in %) of 1st Threshold value |  |  |  |  | 6% |  |  | 61% |  |  |  | 15% | 14% |  |  |
| 2nd. Threshold value |  |  |  |  | 19 |  |  | 4.6 |  |  |  | 320 | 90 |  |  | 0.4257 |
| Deviation (in %) of 2nd Threshold value |  |  |  |  | 12% |  |  | 64% |  |  |  | 23% | 29% |  |  |
| FC10 | **FM14** | **Misalignment due to Excessive Pipe strain.** | **NC** | **NC** | **NC** | **NC** | **(++)** | **NC** | **yes** | **1. Generally excites 1X.  2. 2X / 3X if strain is excessive causing misalignment** |  | **NC** |  | **NC** | **(++)** | **NC** | **NC** |  |
|  | | SV of parameters |  |  |  |  | 17 |  |  | 2.8 |  |  |  |  | 70 |  |  |  |
| 1st. Threshold values of parameters |  |  |  |  | 18 |  |  | 4.5 |  |  |  |  | 80 |  |  | 0.2696 |
| Deviation (in %) of 1st Threshold value |  |  |  |  | 6% |  |  | 61% |  |  |  |  | 14% |  |  |
| 2nd. Threshold value |  |  |  |  | 19 |  |  | 4.6 |  |  |  |  | 90 |  |  | 0.3487 |
| Deviation (in %) of 2nd Threshold value |  |  |  |  | 12% |  |  | 64% |  |  |  |  | 29% |  |  |