

**An Investigation on 4 units of Quench Water Cooler Fan Vibration Problem, 2005**

The QW Cooler fan high vibration problems were investigated. Based from the Modal analysis and Finite element analysis on the QW Cooler fan, the “fan ring” had generated unexpected lower natural frequencies and mode shapes in the operating region of the QW Cooler fan. In conclusion, these problems are classified as a combination of near resonance and stiffness-controlled situation.

ODS analysis revealed the movements of the QW Cooler fan mainly due to the flexible fan ring. Although, observation of the QW Cooler fan operation shape showed large deflection on the motor support; but it was the secondary effect caused by the fan ring movement. These secondary effects of the fan support movement that had caused usually caused the alarm to trigger.

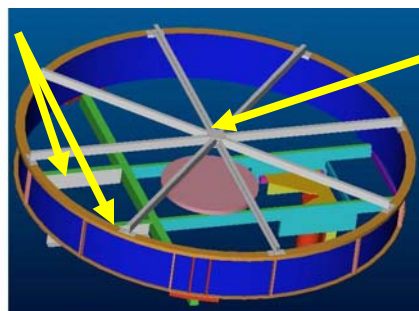
From Modal analysis, it indicates a number of natural frequencies close to the fan blade passing frequency of 14.4Hz. These unexpected lower modes were generated by the flexibility of the fan ring. Modeling the QW Fan Cooler fan support using Finite Element Analysis had successfully revealed all the modes of vibration and established a correlation with the Modal analysis results. The results summary is as shown below.

Based from the Structural Dynamic Modification Procedure using FEA, MDT-Q2 recommendation is to rectify / strengthen the fan ring by adding 4 C-channels to shift the fan ring lower natural frequencies and its mode shape. Additional stiffening with 2 C-Channel is also required to further strengthen the existing motor support. The recommended stiffening is calculated as per the structural dynamic modification using FEA.

Modal Analysis And FEA Results Summary For QW Cooler Fan

Mode Shape	Modal Analysis				FEA	
	Unit DA	Unit DB	Unit EA	Unit EB	Original	SDM
Fan Support + Fan Ring – Heaving	12.1	-	-	12.2	12.7	-
Fan Support + Fan Ring – Twisting	-	12.5	12.5	-	13.7	20.3
Fan Support + Fan Ring – Cantilever	16.6	16.8	16.4	16.0	16.5	-
Fan Support + Fan Ring – Bending	18.5	18.9	18.8	19.0	21.2	19.5

**Modification #2:**  
Extension of the motor support parallel C-Channel



**Modification #1:**  
C-Channel on top of the Fan Ring

Structural Dynamic Modifications