

Visual Signal 教育訓練

結構自然頻率之估測

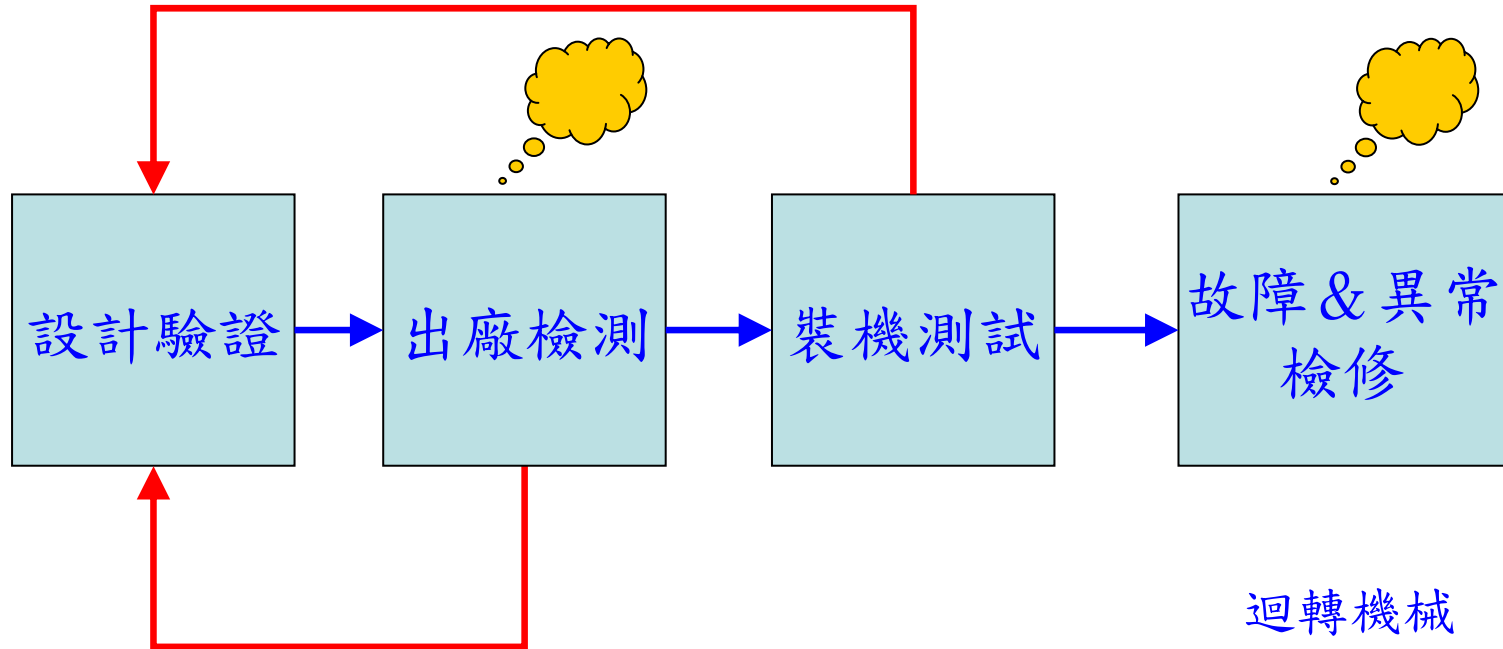
利用雙訊號相關性分析技術

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逸奇科技

2010/7/7

Why 振動噪音檢測？



FEM模型
原型驗證
參數調測

生產履歷：
製造&組裝
品保資料庫
臨界轉速

客戶機台
動態特性
操作頻率
臨界轉速

迴轉機械

主軸
齒輪
軸承
馬達

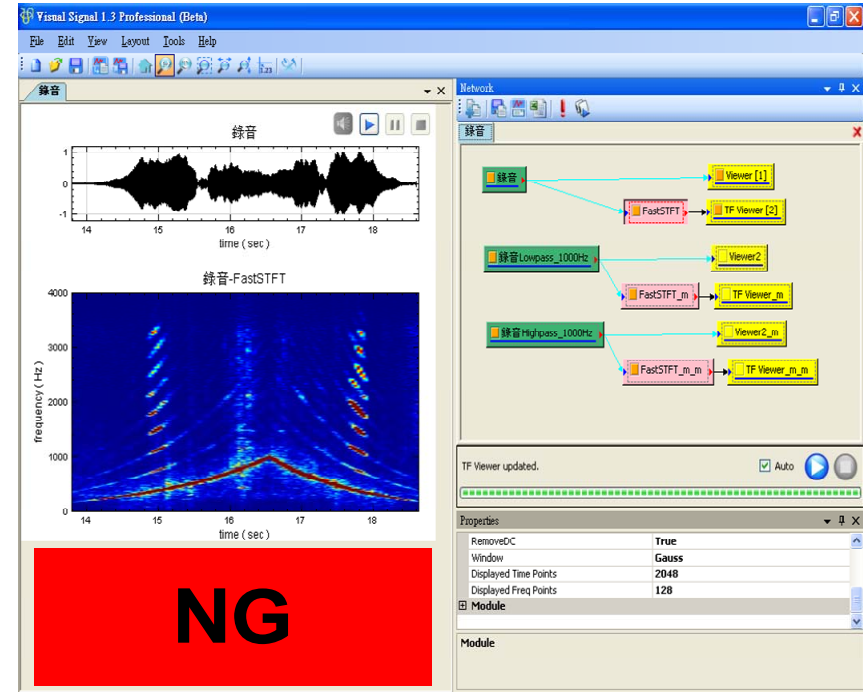
PC-based檢測系統架構

- 軟體

- 檢測與監測操作平台(Visual Signal)
- 資料擷取軟體(DAQ API)
- 振動與噪音分析模組(SVM)

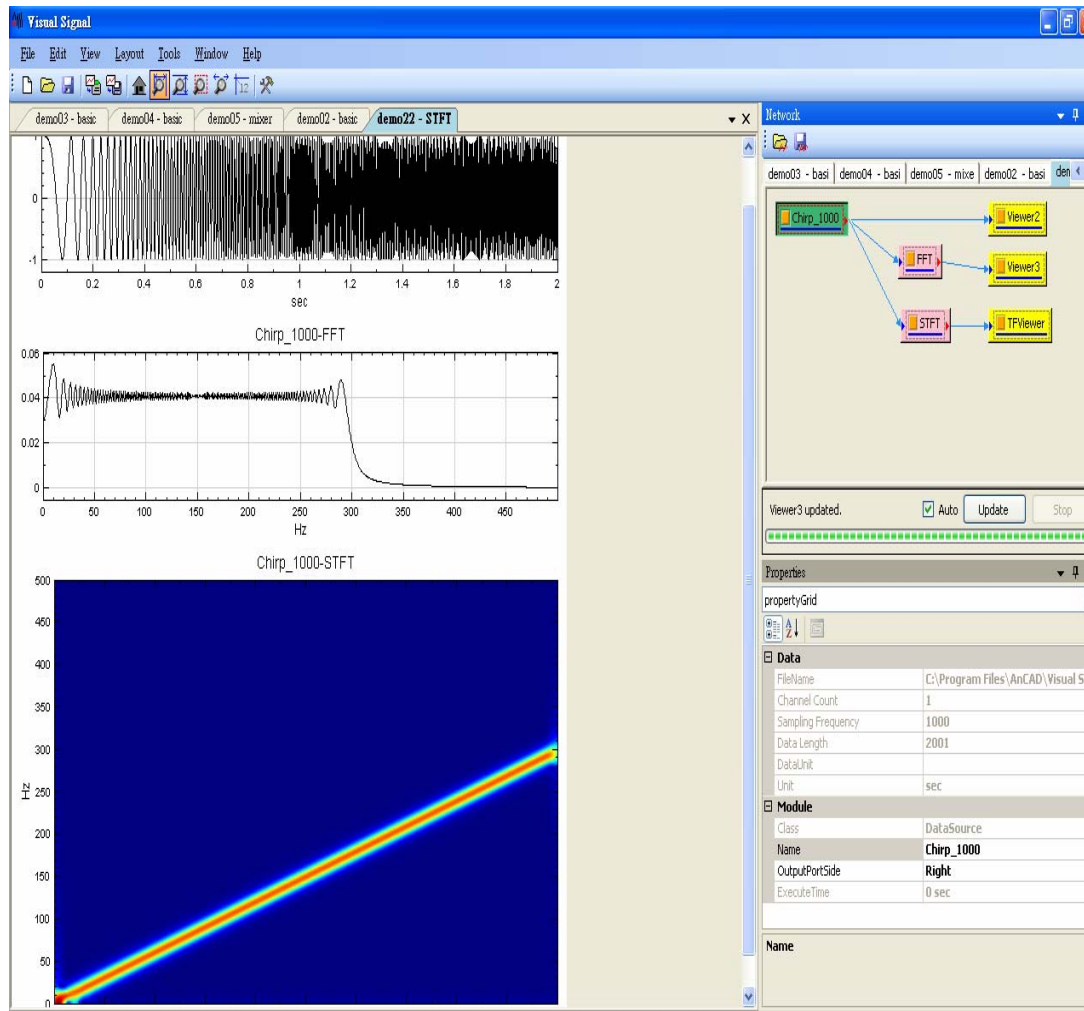
- 硬體

- 資料擷取卡(NI DAQ)
- 加速規
- 麥克風



Visual Signal：軟硬體整合平台

- 專注於找出問題與解決問題，而非學習程式與訊號處理。



資料擷取硬體
檔案
使用者自建函數

輸入

雜訊濾除
趨勢移除
時間域分析
頻率域分析
時頻分析
統計分析
矩陣與數學運算
MATLAB, DLL

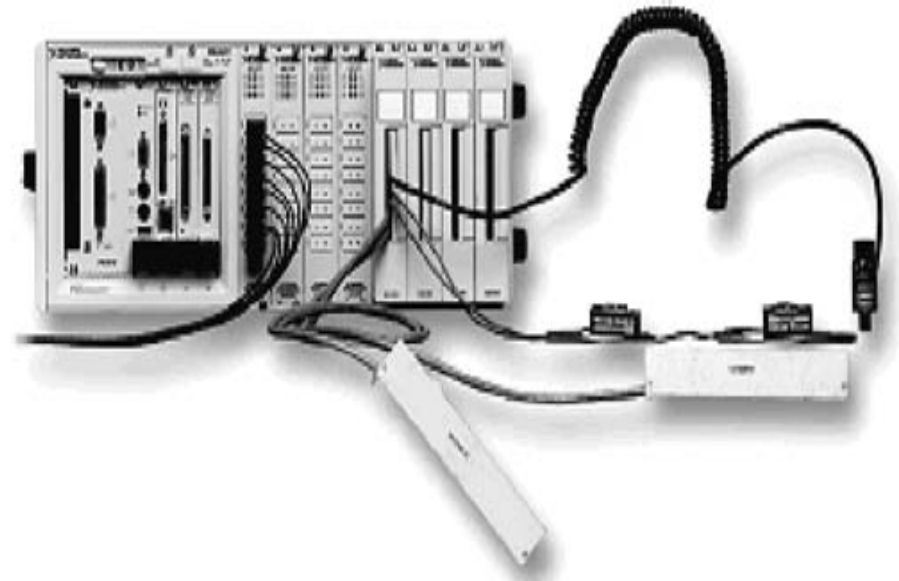
分析

輸出

圖形
檔案
訊號產生器



資料擷取卡擴充性：可攜式、工業用、分散式



Wireless Vibration Analyzer

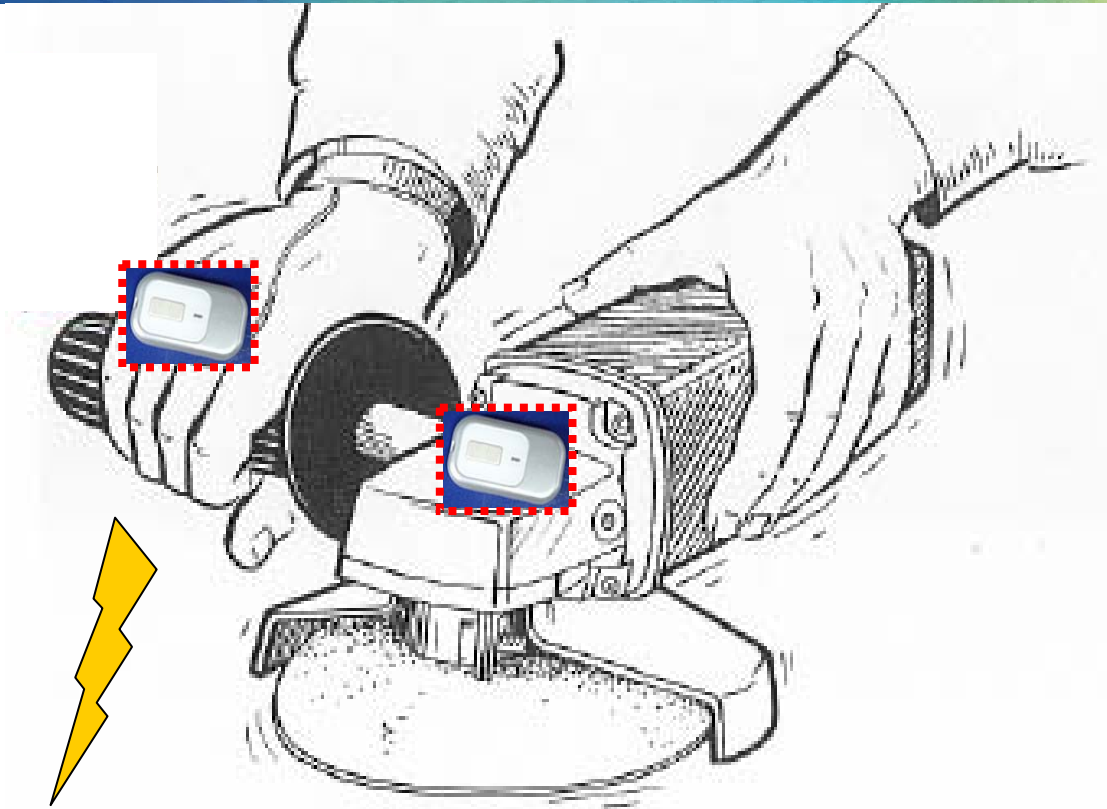
8通道：

- ✓MEMS三軸加速規
- ✓溫度
- ✓生理訊號

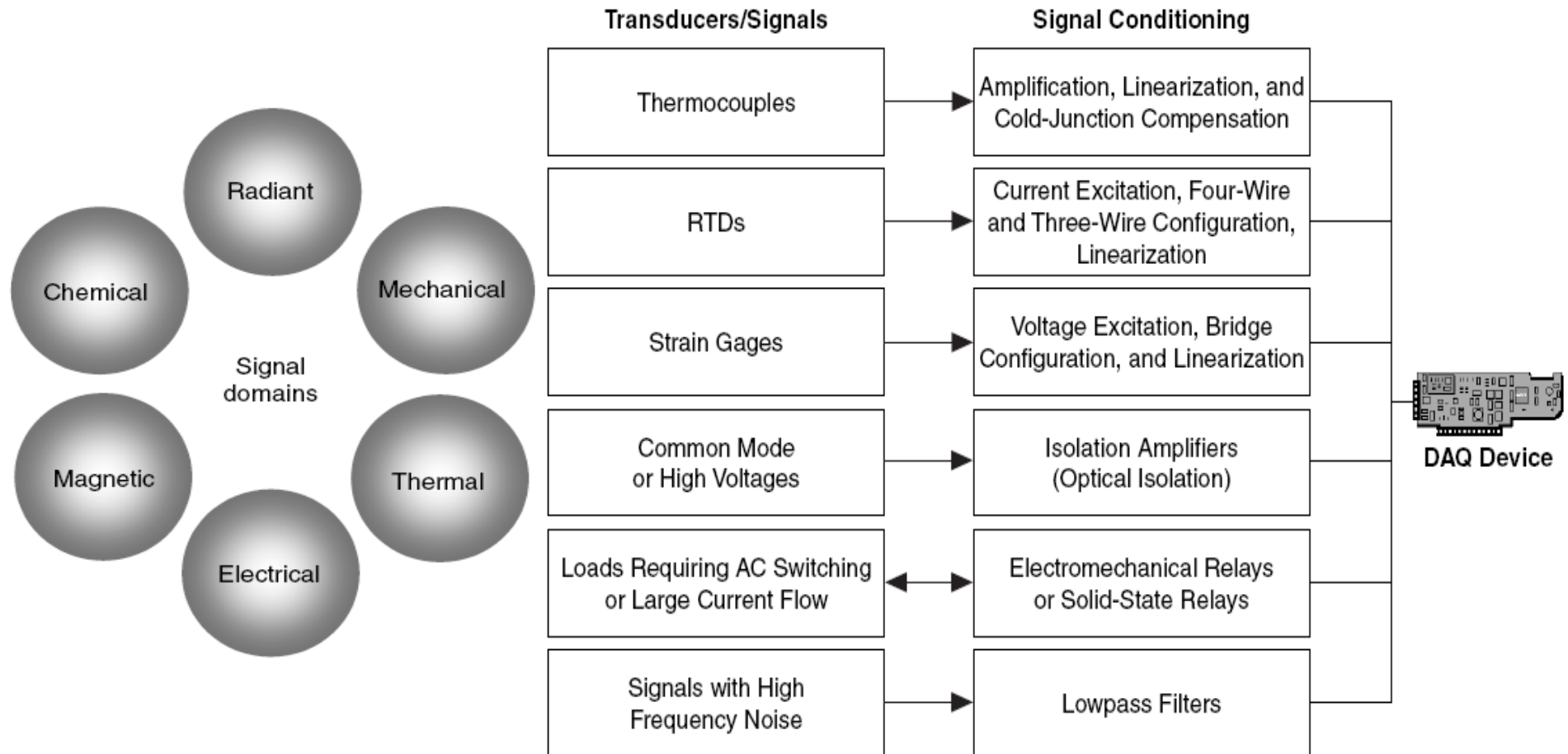
TD1A



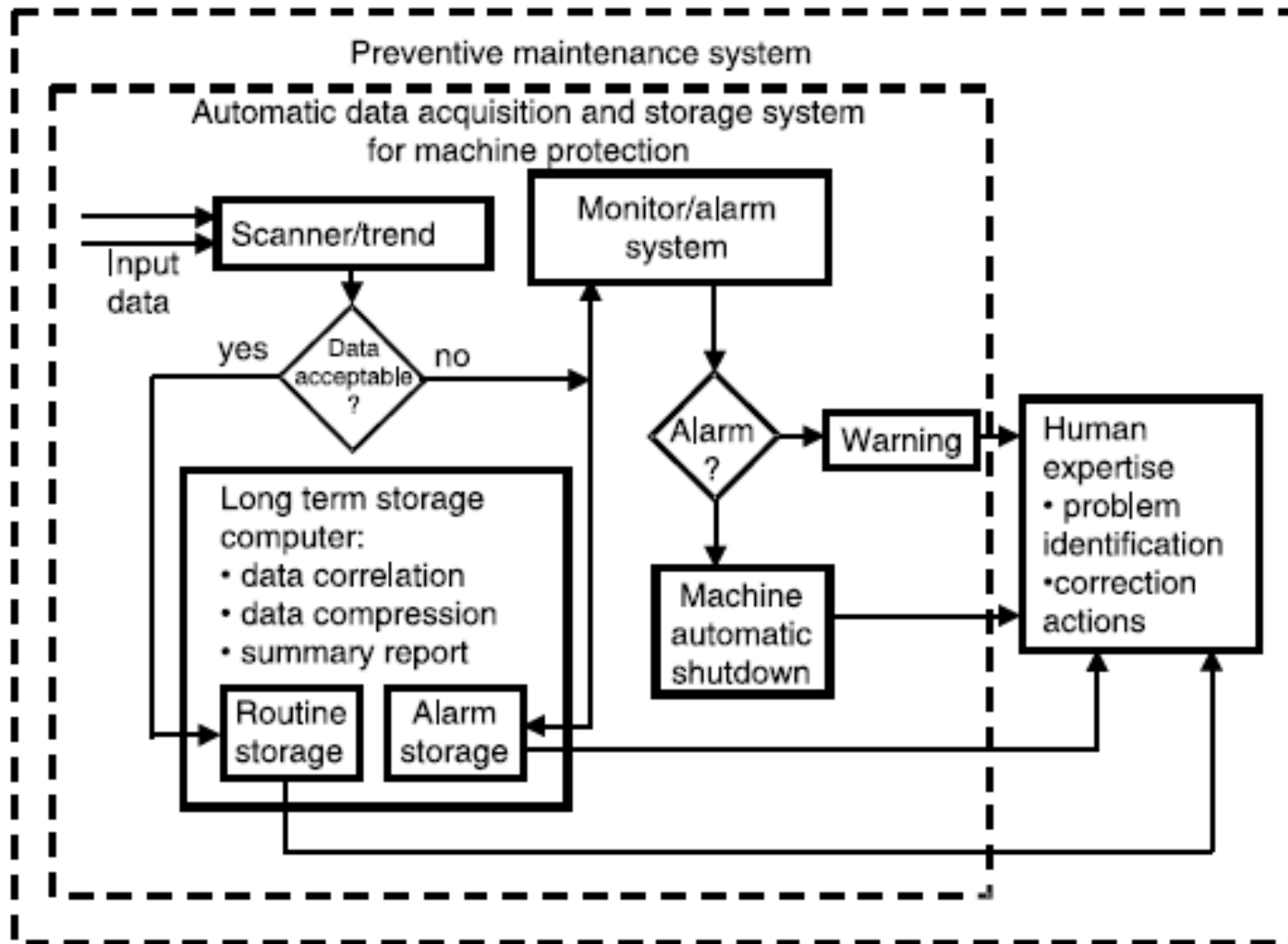
Wireless



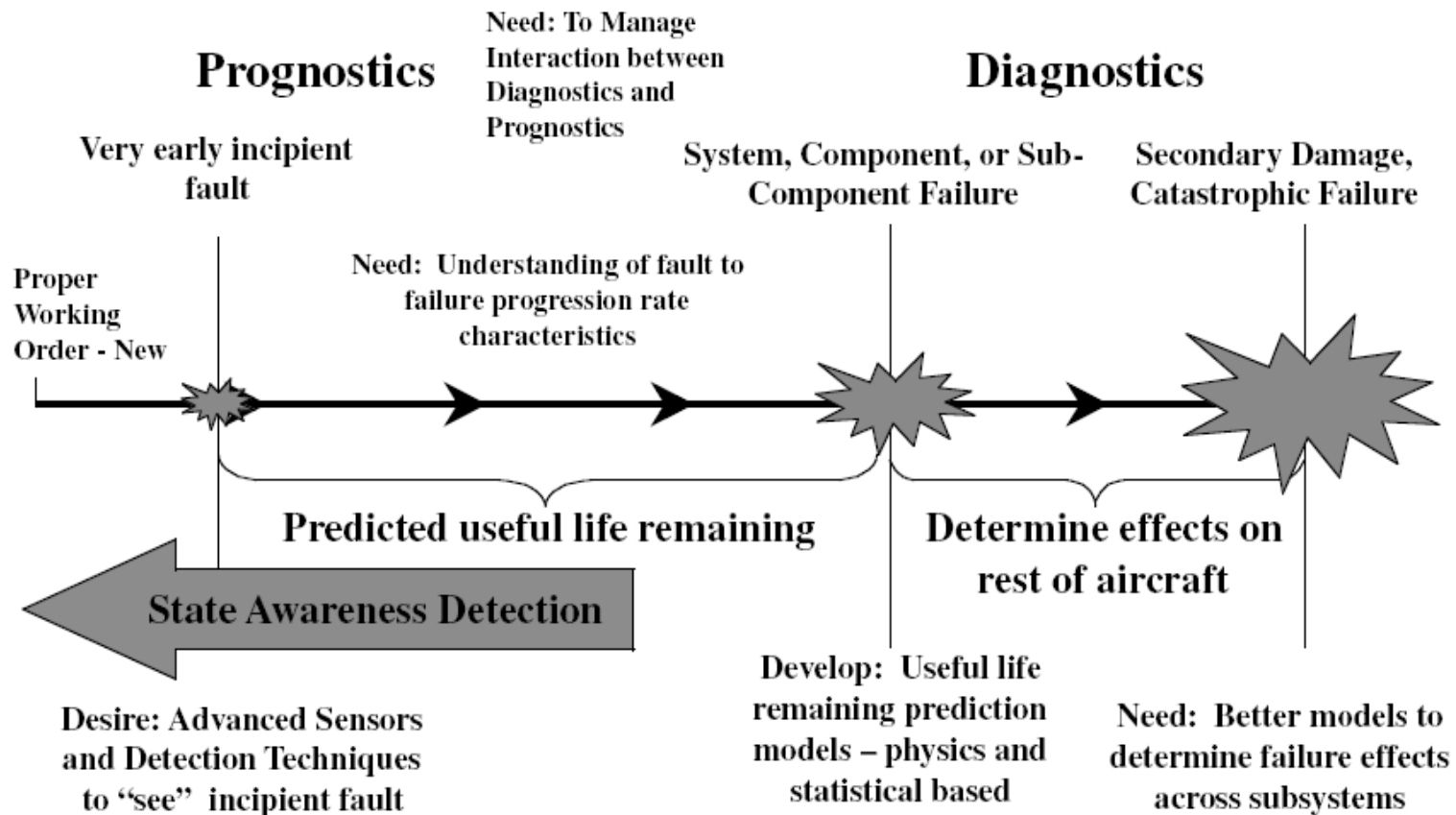
感測器擴充性：多物理場訊號擷取與整合



軟體擴充性：預防保養系統

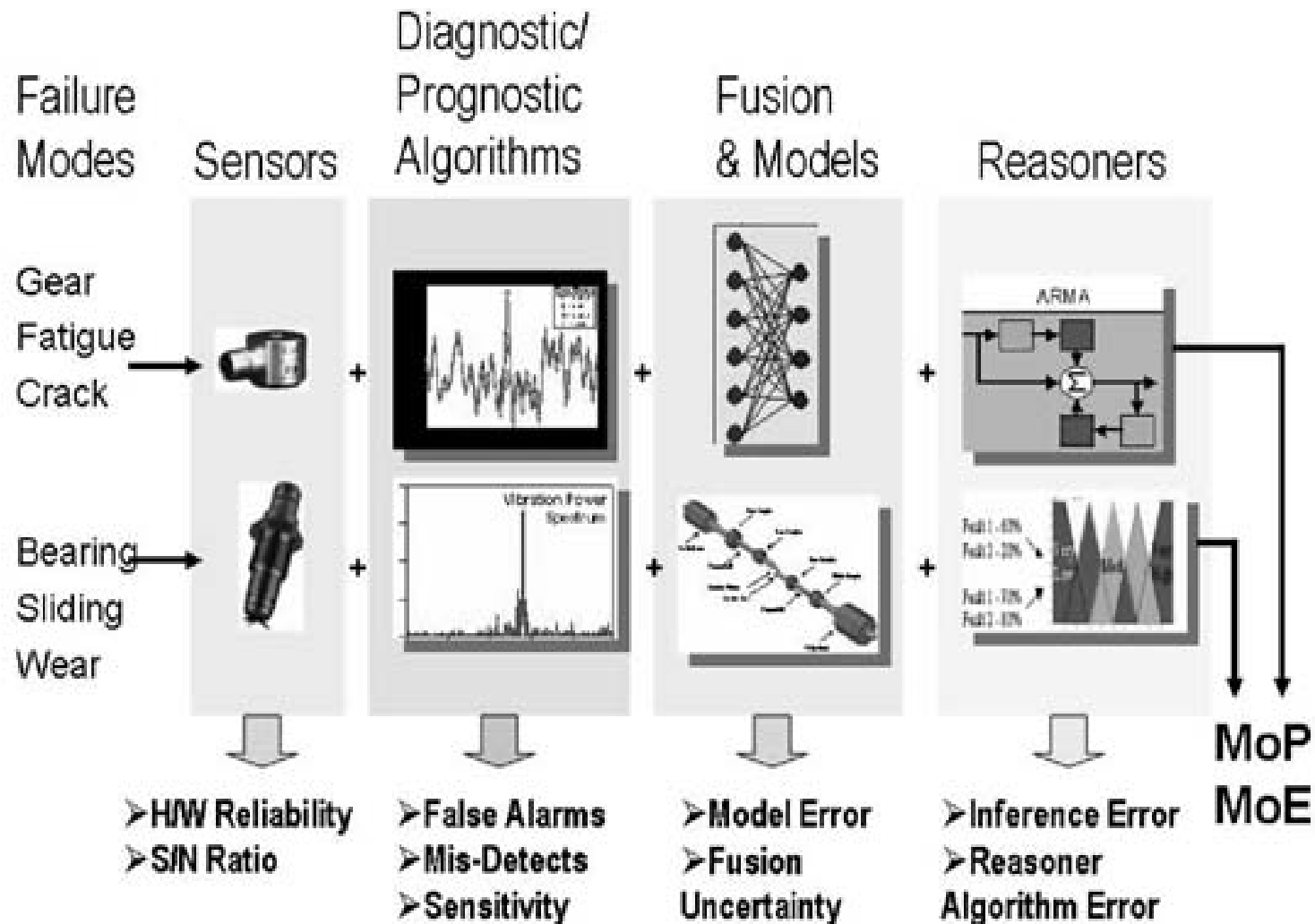


軟體擴充性：線上故障預知與診斷系統

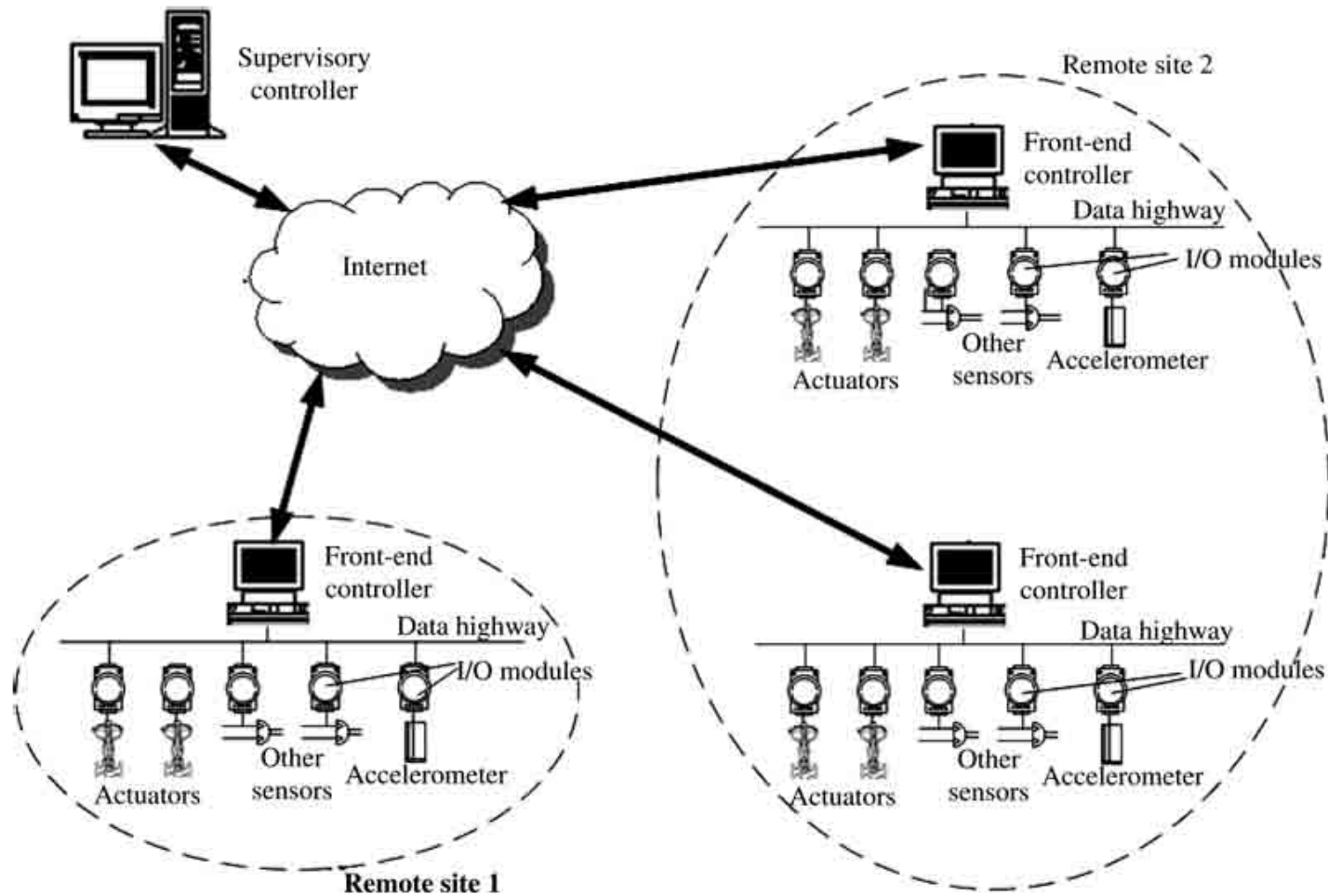


The Goal is To Detect “State Changes” as Far to the Left As Possible

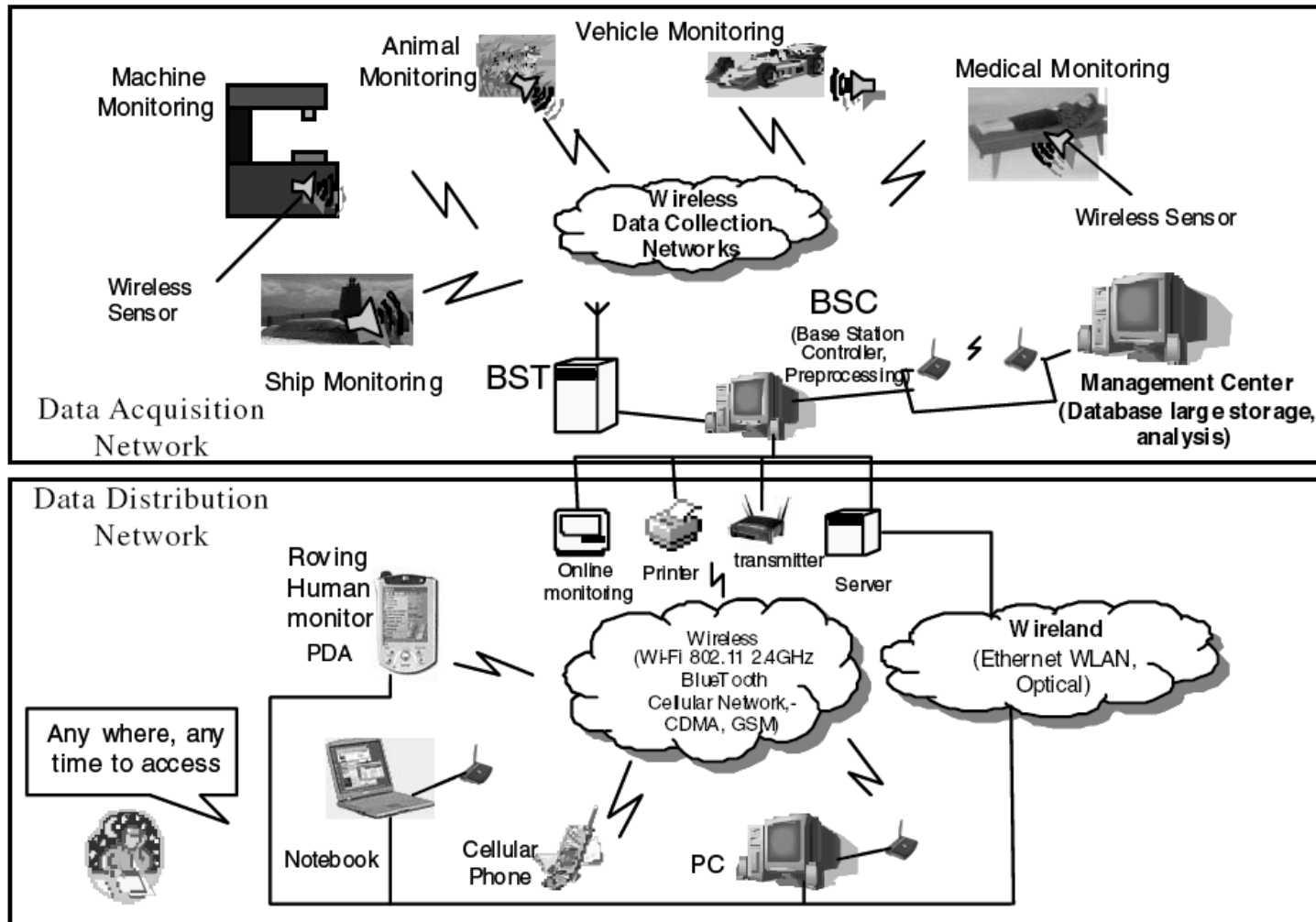
軟體擴充性：智慧型診斷系統



軟體擴充性：遠端監測與控制系統

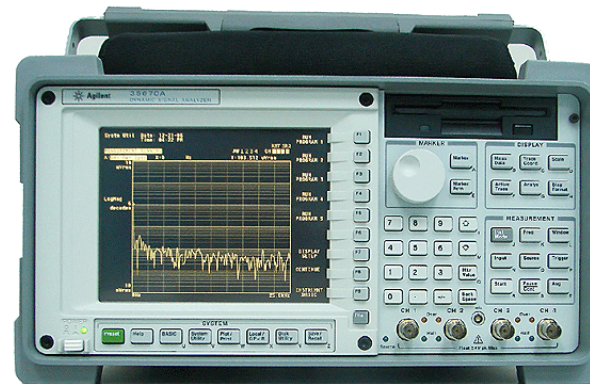


軟體擴充性：資料庫建立與傳輸網路系統

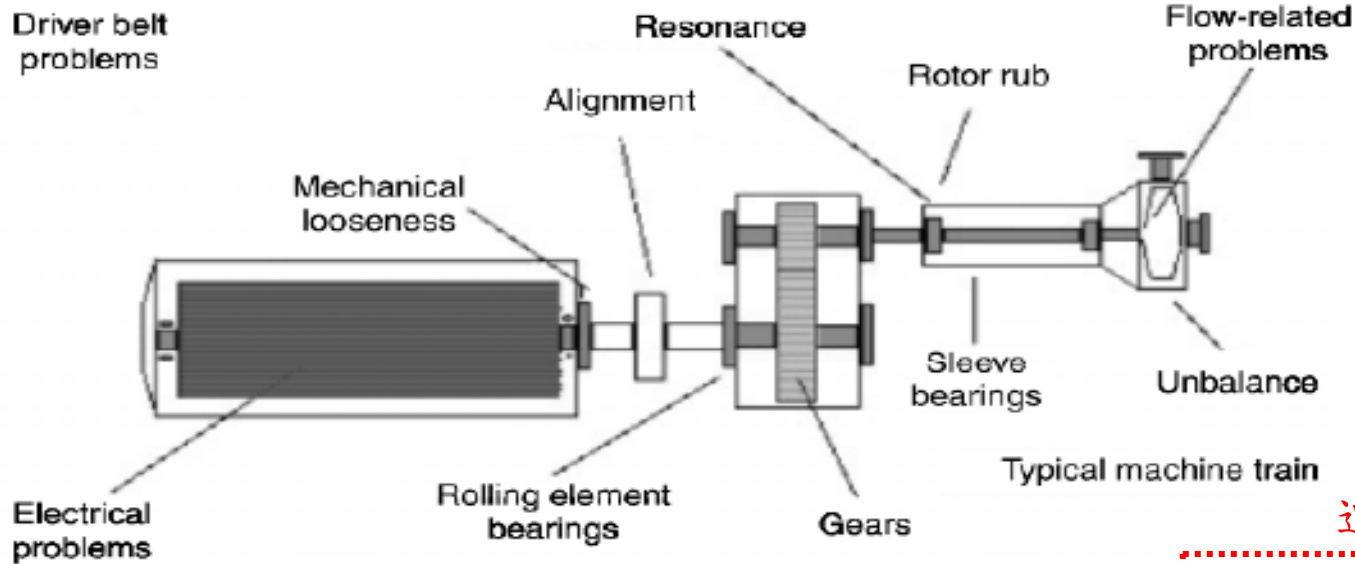


Why Sound and Vibration Module?

- **Vibration Level**
 - RMS: RMS, Peak, Peak-to-Peak
 - Crest Factor
 - Peak : Max, Min, True Peak, True Peak-to-Peak
- **Sound Level**
 - A, B, and C Weighting
 - Octave
- **Order Tracking**
 - Digital Tacho
 - Order Tracking by STFT
 - Order Tracking by EnMorlet
- **Bearing Analysis**
 - Bearing Defect
 - Envelope Detection
- **Cepstrum**
- **Scale...**

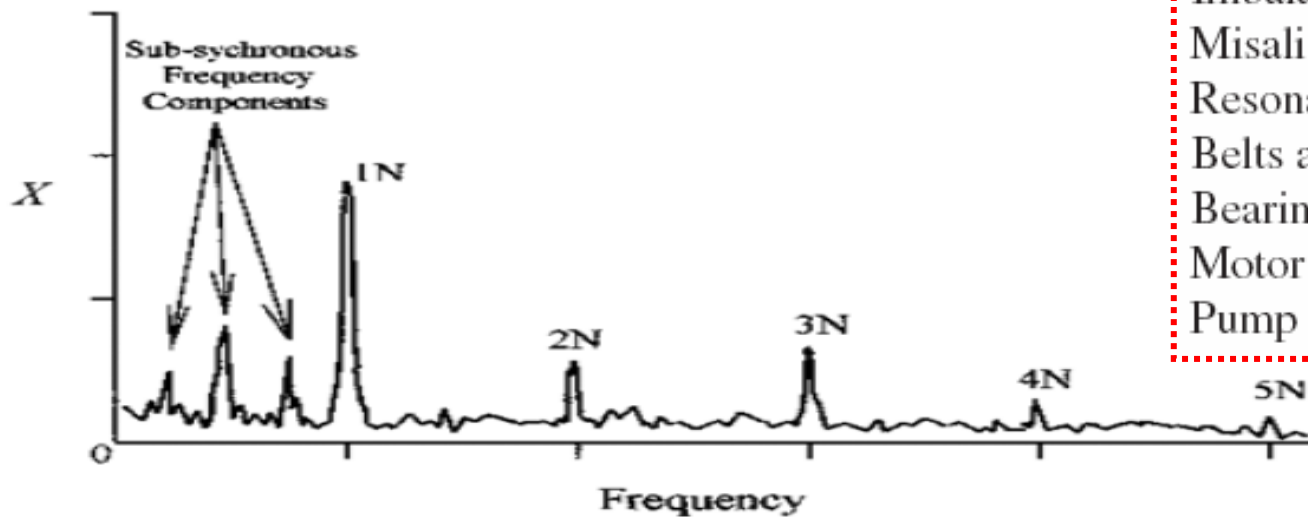


迴轉機械之振動頻譜

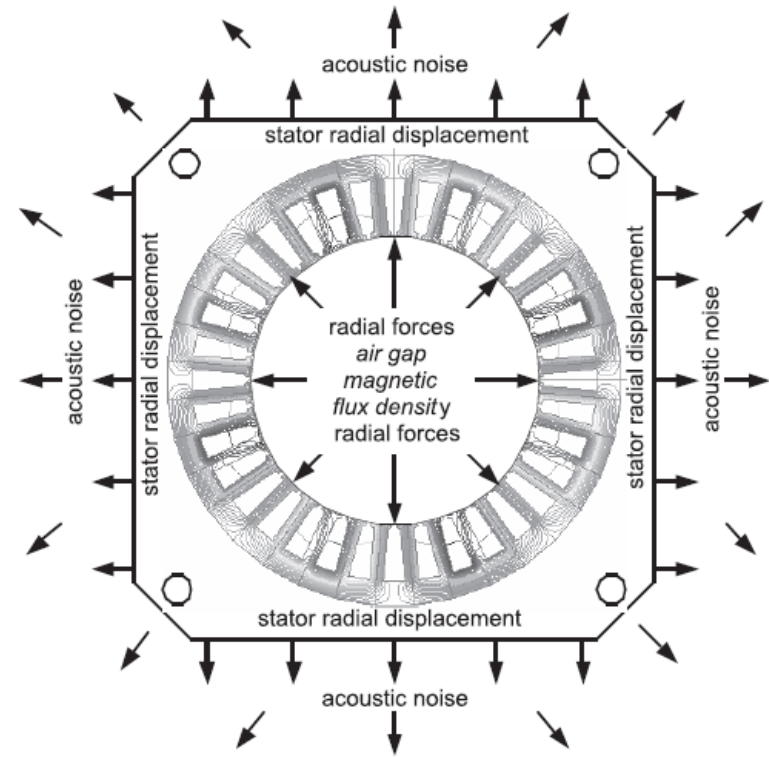
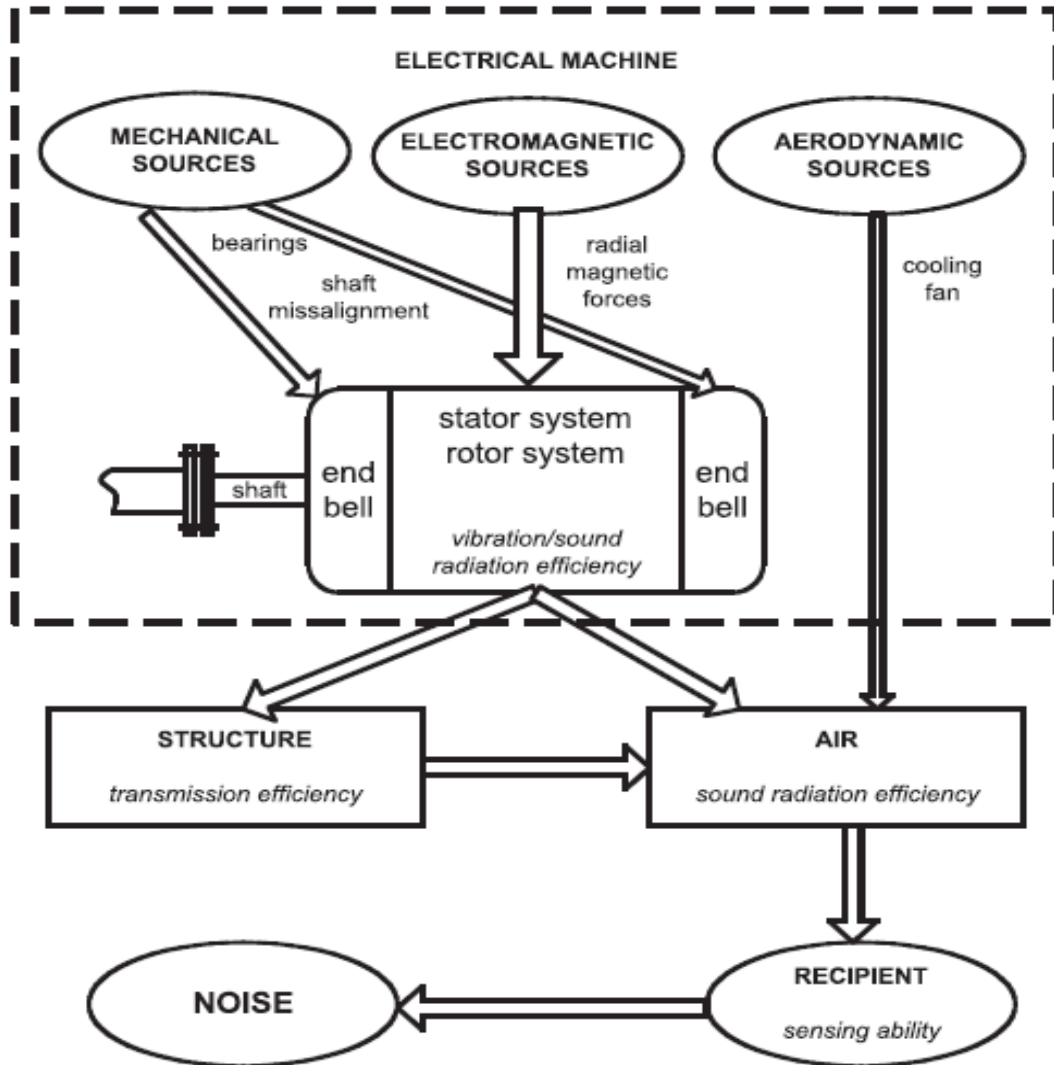


迴轉機械異常原因排序

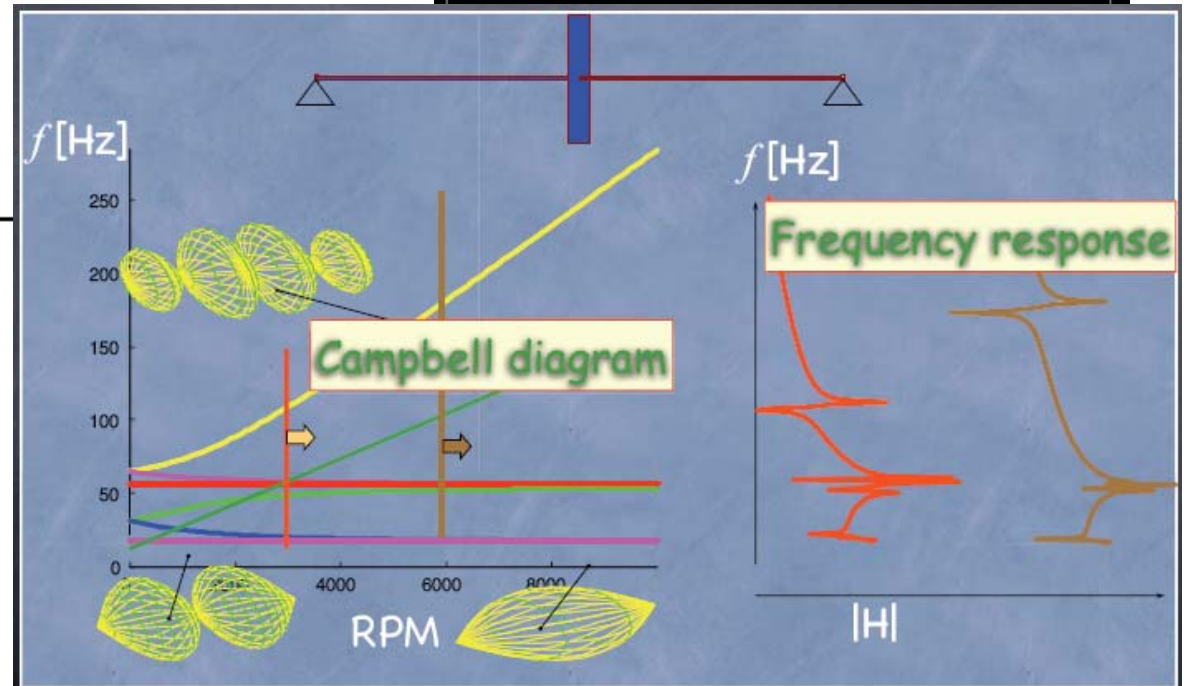
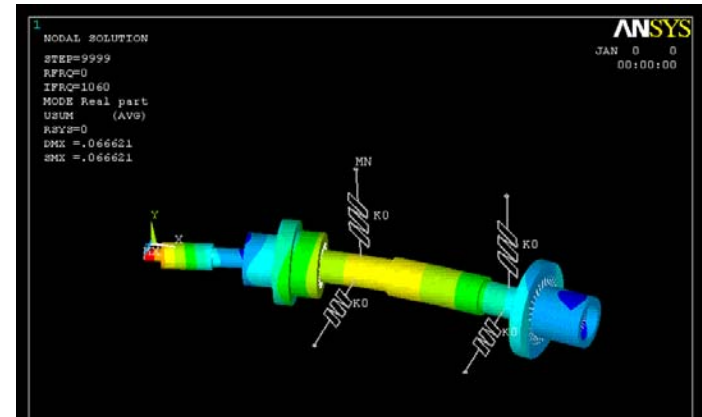
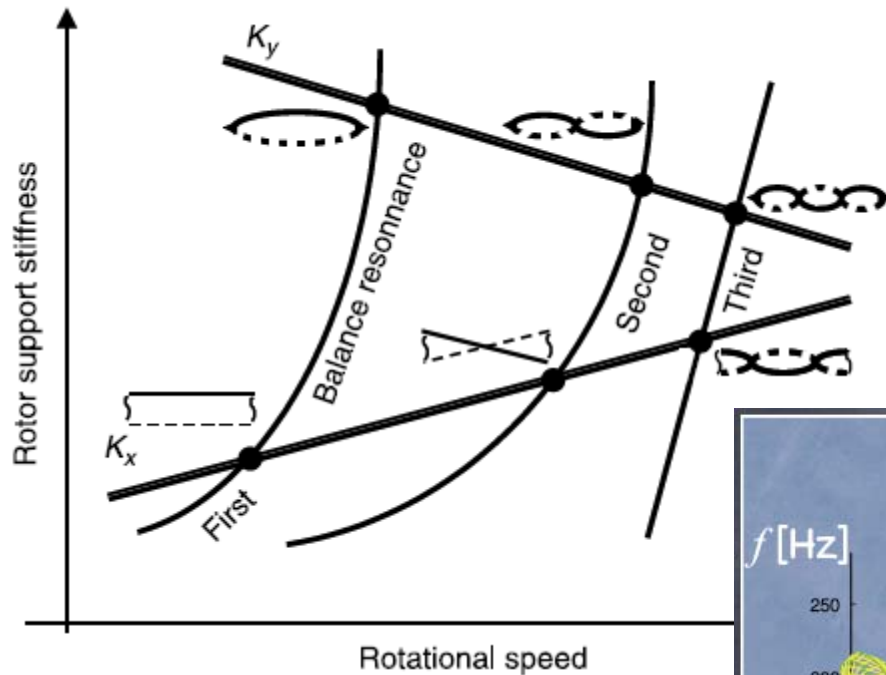
Imbalance	40%
Misalignment	30%
Resonance	20%
Belts and Pulleys	30%
Bearings	10%
Motor Vibration	8%
Pump Cavitation	5%



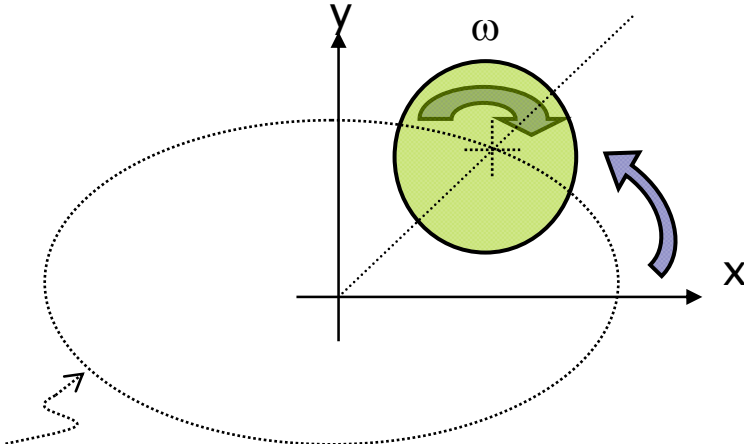
Vibration ↔ Noise



軸承剛性與主軸臨界轉速之關係

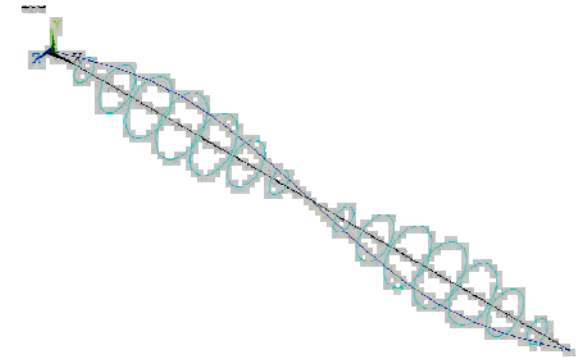


Campbell Diagram



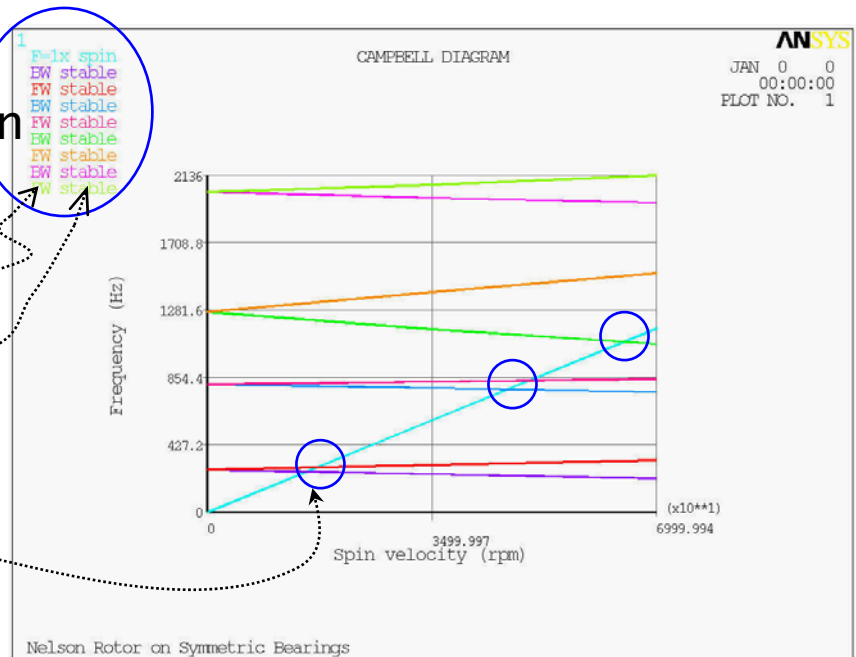
Elliptical whirl orbit

whirl motion



As frequencies split with increasing spin velocity, ANSYS identifies:

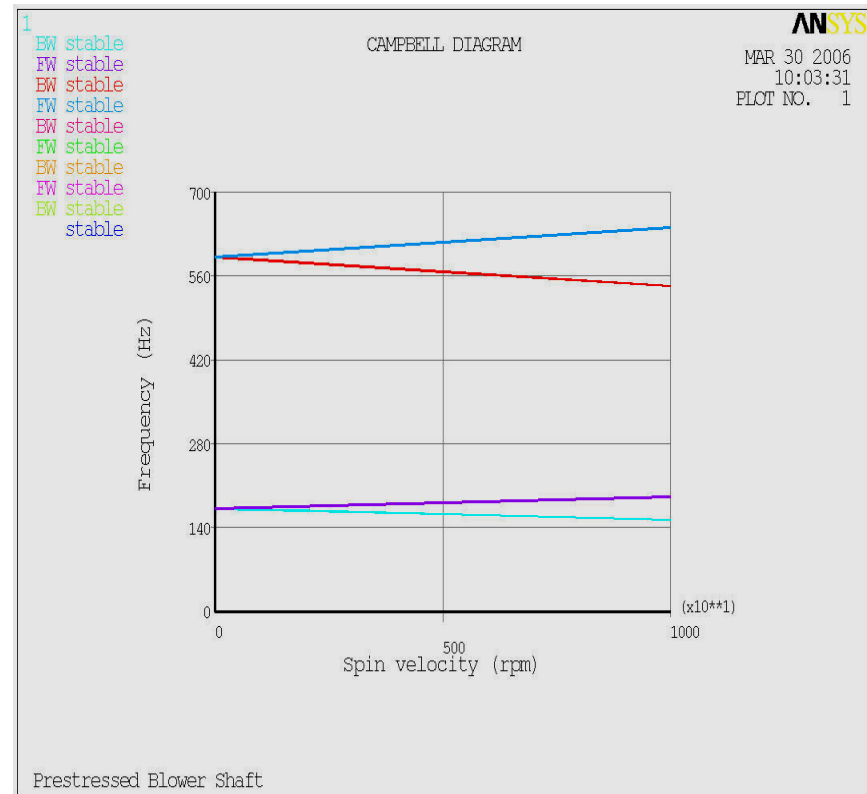
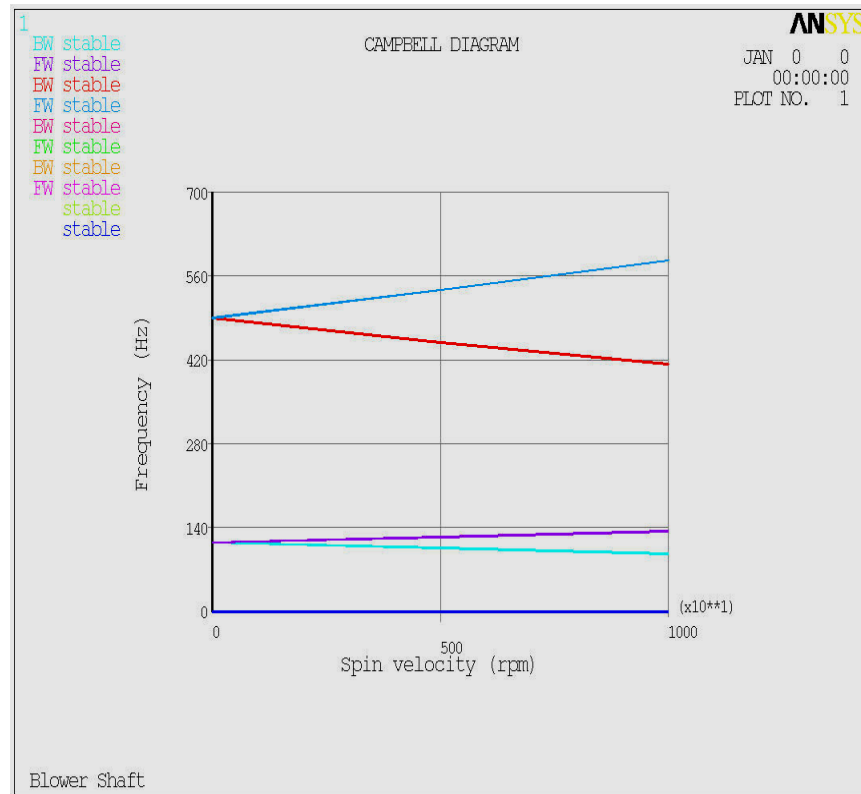
- forward (FW) and backward (BW) whirl
- stable / unstable operation
- critical speeds (PRCAMP)



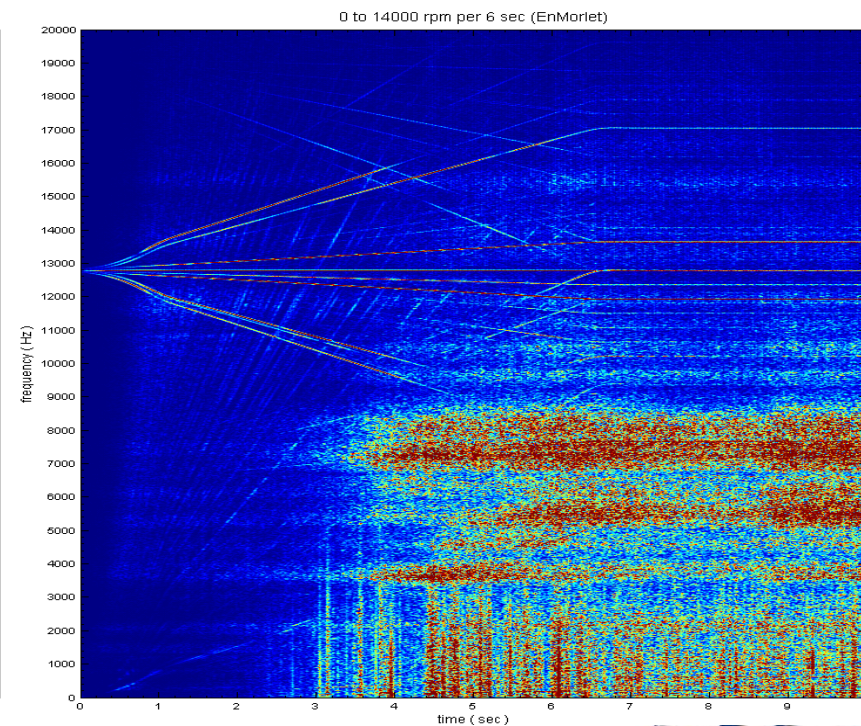
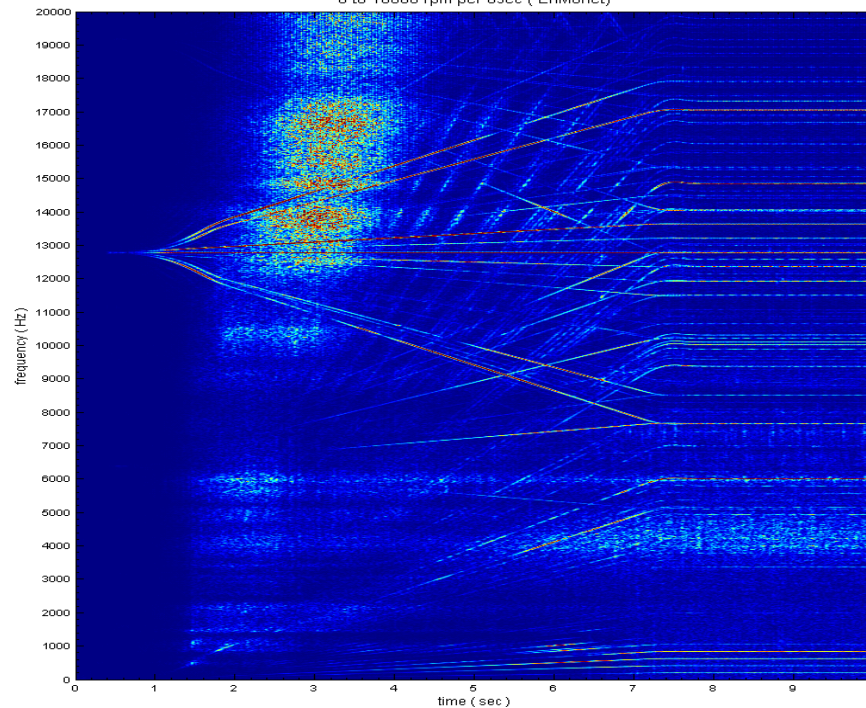
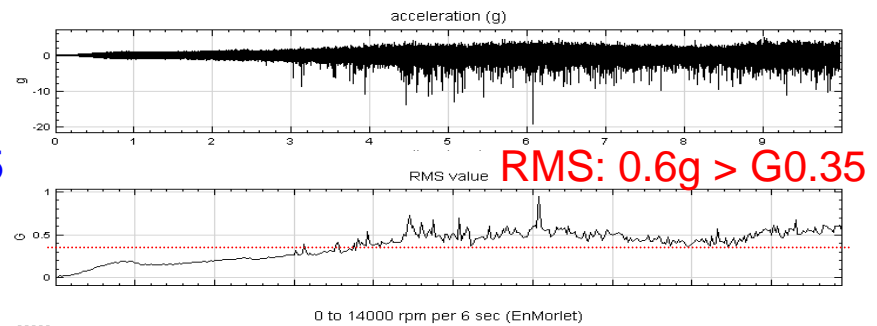
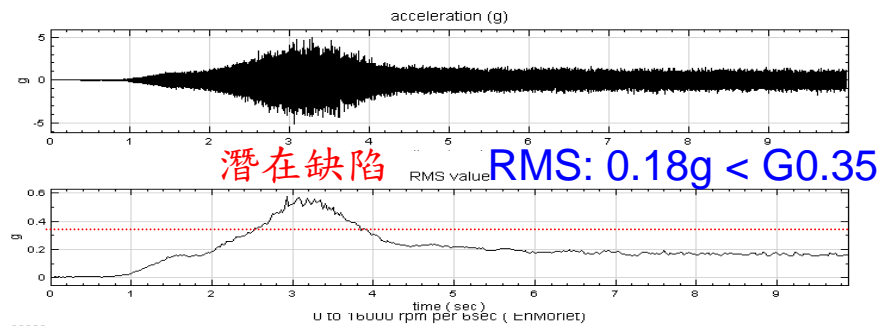
軸承剛性對自然頻率之影響

No prestress

With thermal prestress

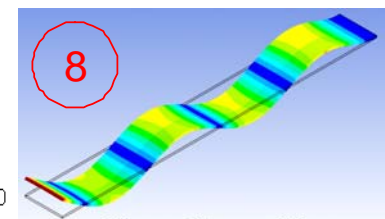
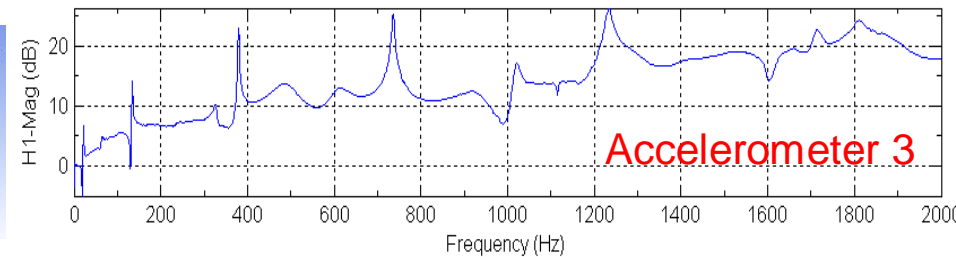
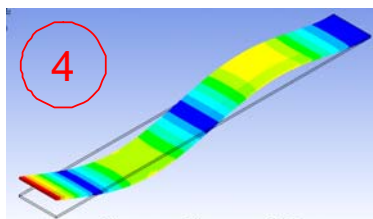
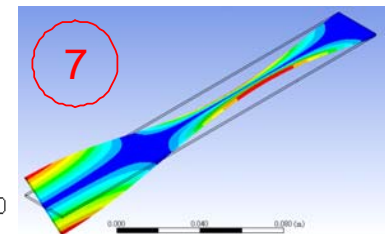
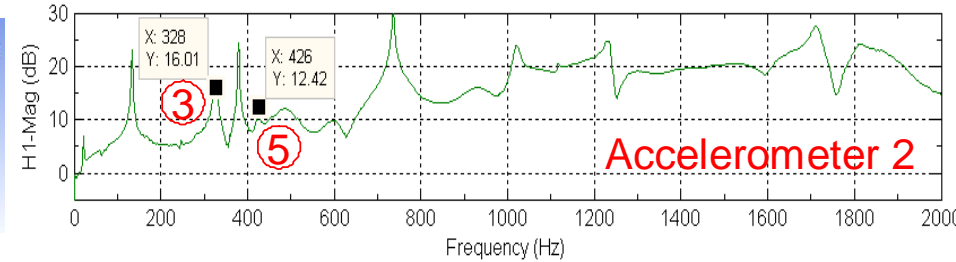
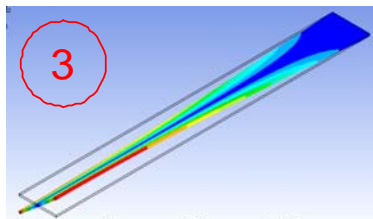
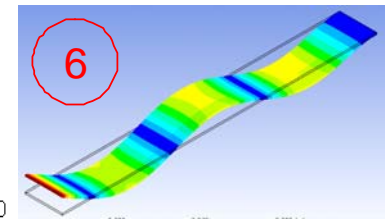
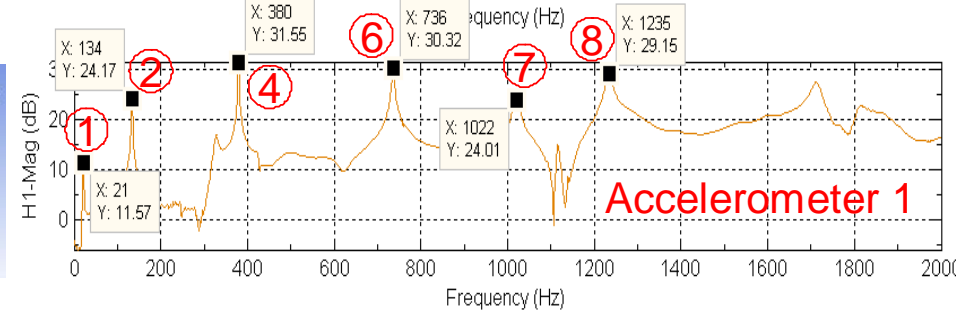
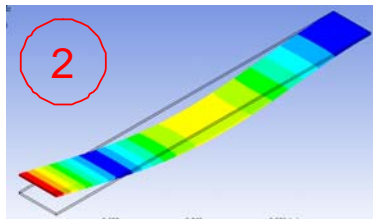
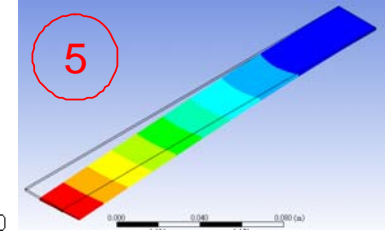
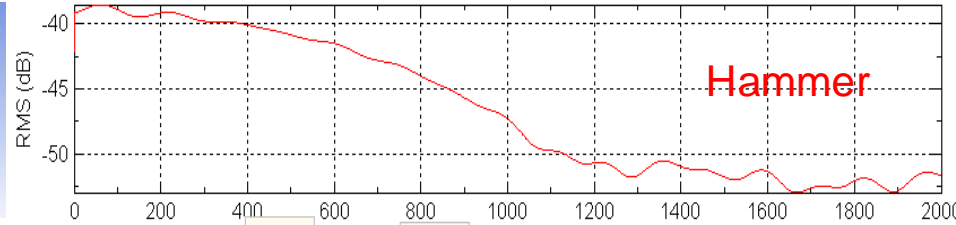
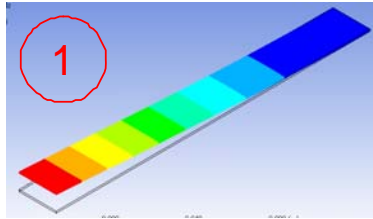


Why 變轉速時頻分析? ⇨ 潛在缺陷檢出 故障排除



結構之自然頻率檢測

利用敲擊測試之自然頻率驗證有限元素分析之正確性

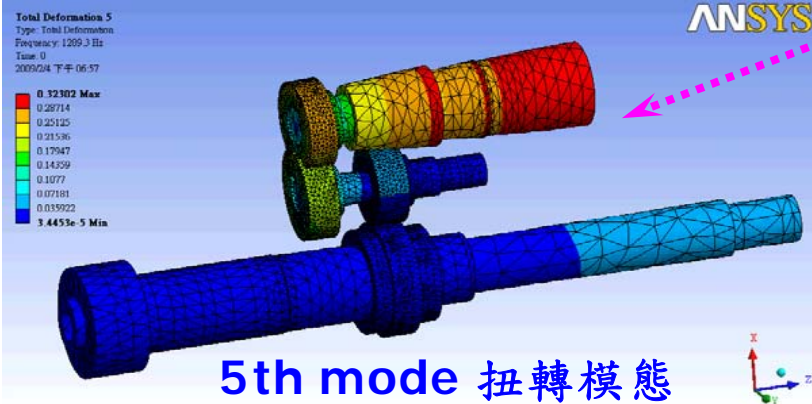


結構之自然頻率檢測

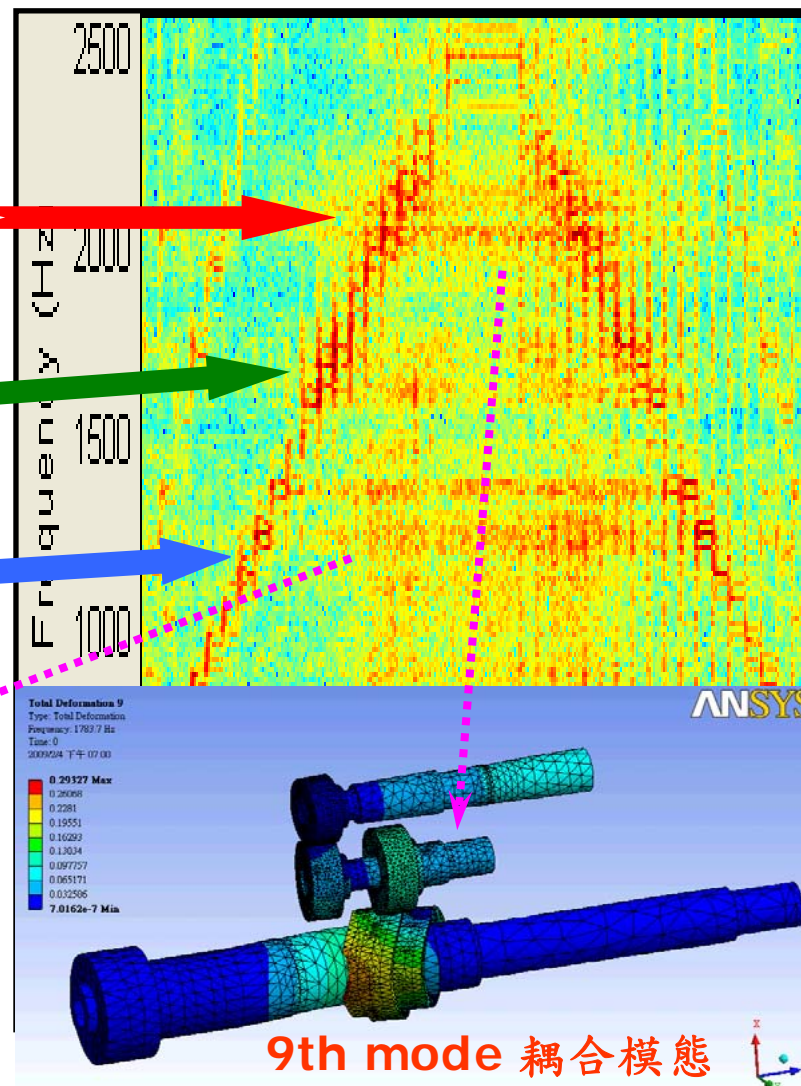
利用變轉速時頻驗證有限元素分析之正確性

FEM模擬結果：

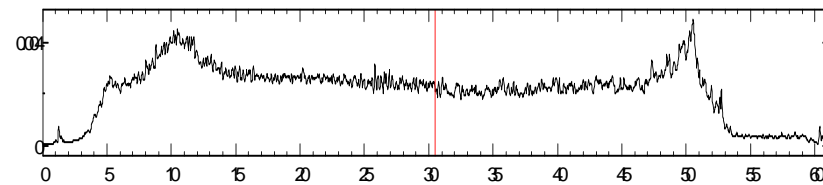
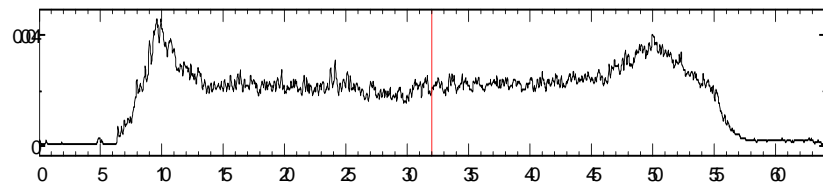
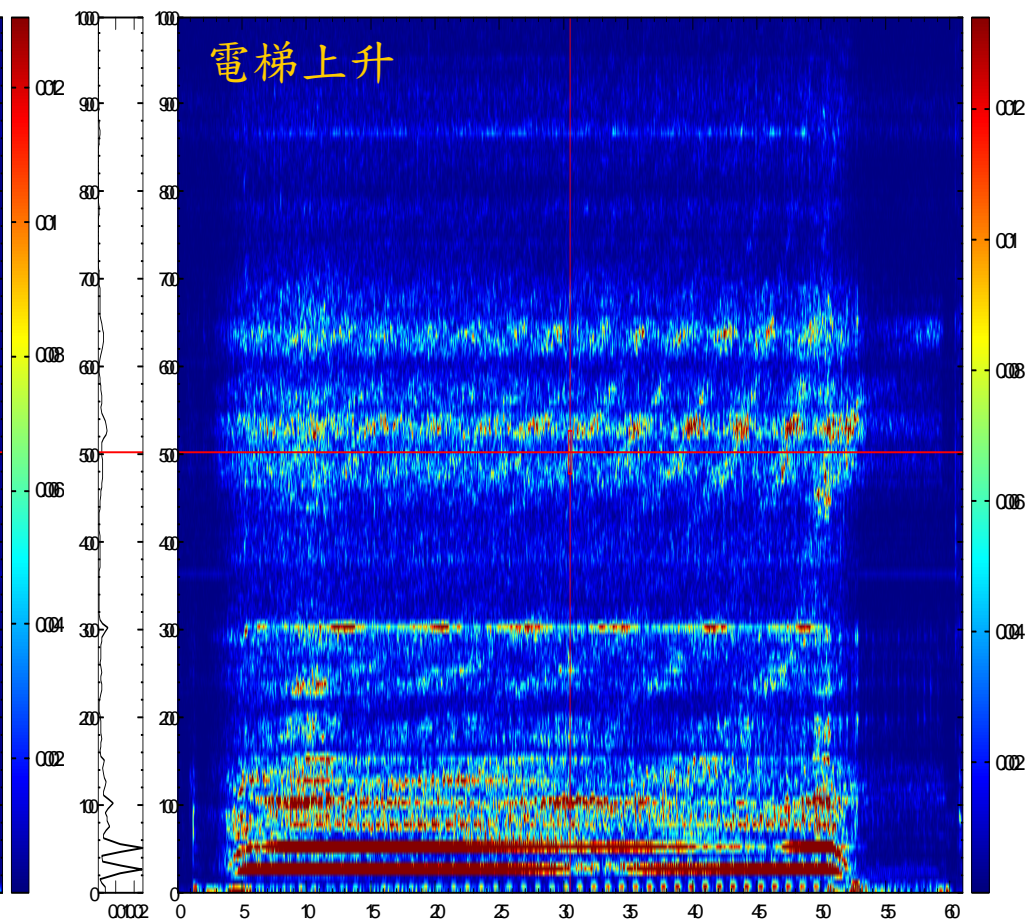
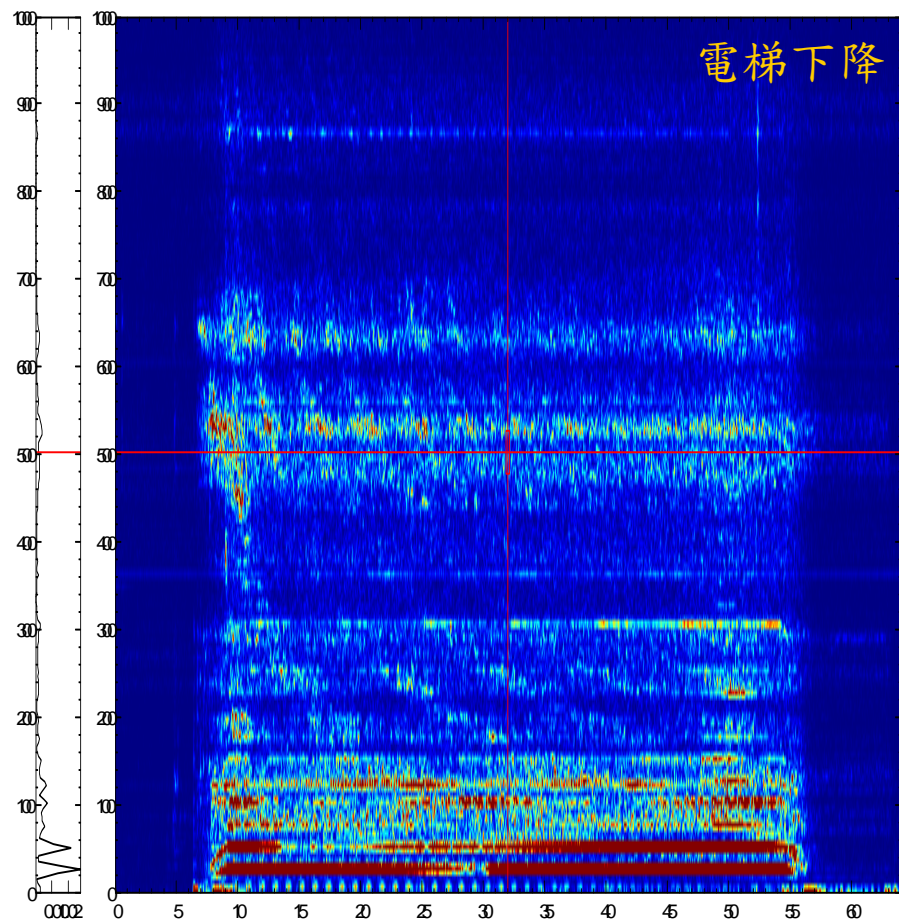
模態	模態形式	自然頻率 (Hz)
12	Coupling	2289
11	Coupling	2176
10	Coupling	2003
9	Coupling	1784
8	Torsion	1541
7	Bending	1421
6	Bending	1415
5	Torsion	1289



量測結果：



電梯系統振動時頻分析



各應用層面可檢測項目

