Design for the Vibration Monitoring System of Neutron Choppers

The neutron choppers are indispensable equipments for the time-of-flight neutron scattering spectrometers of China Spallation Neutron Source (CSNS). Choppers which are surrounded by shield because of the neutron radiation are difficult to maintain. A set of distributed vibration monitoring system is developed to realize vibration monitoring for neutron choppers. This system can monitor the vibration of all choppers at the same time and implement many functions, such as current status determination, fault diagnosis, trend prediction, machine protection, etc.

The system has been applied in neutron choppers of the CSNS first-stage construction, and has good application effect.

Function

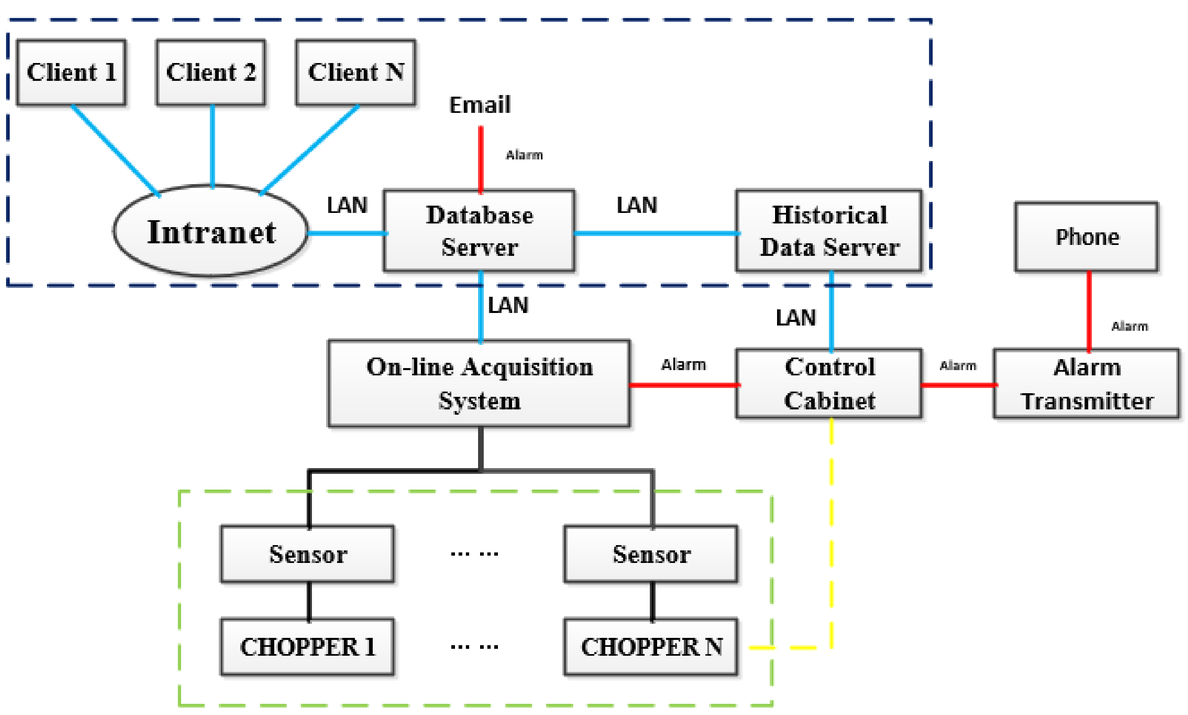
1、Display the vibration value of each measuring point of the chopper synchronously in real time.

2、The system will alarm when any measuring point is abnormal.

3、The system can output an alarm signal to the control system. When any monitoring point exceeds the set threshold for a long time, the status monitoring system outputs signal to request the control cabinet to shutdown.

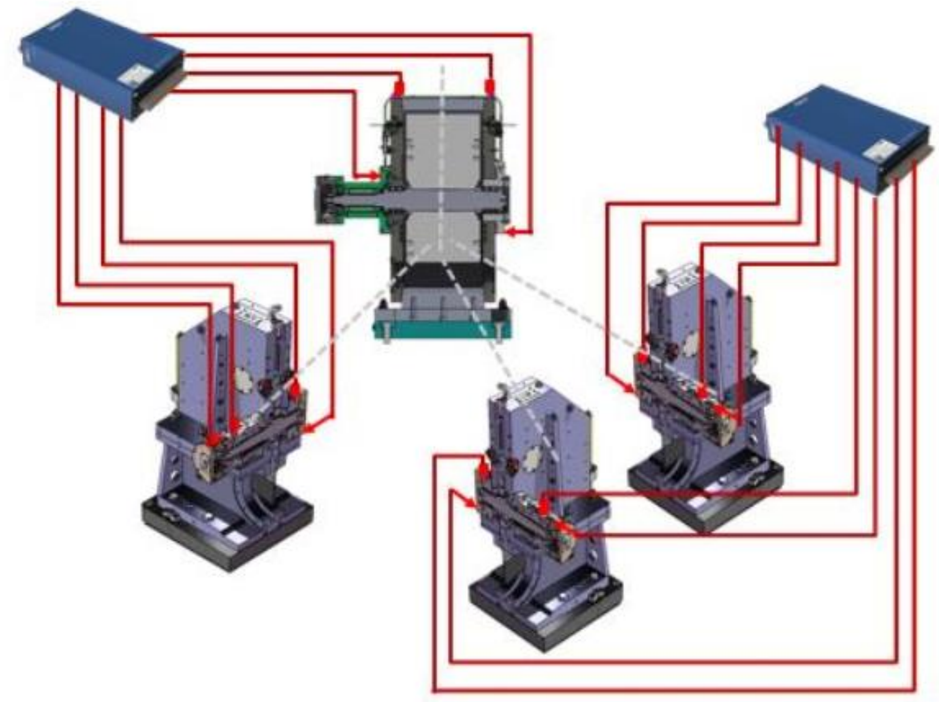
4、Users can analyze the fault type of the bearing according to the obtained signal, predict the service life of the bearing,

System structure diagram



The monitoring hardwares of each spectrometer is independent of each other, and all datas are collected on the only one server through the Internet.

Measuring points



Each chopper is arranged with 4 measuring points at the bearing seats: horizontal and t vertical direction of the drive end、 horizontal direction of the non-driving end、 axial.
PS: Generally the horizontal vibration is greater than the vertical due to different rigidities.

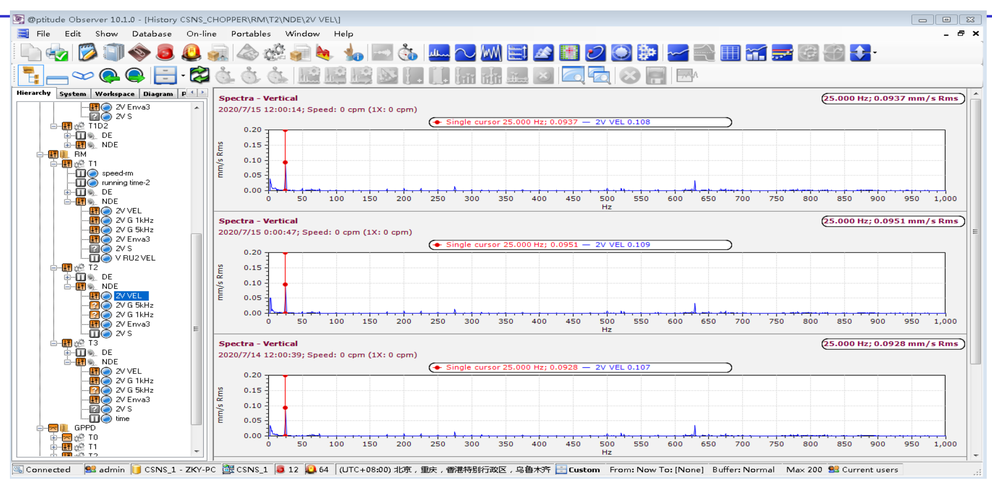
Result

Vibration test is the best standard to verify the mechanical design of chopper.

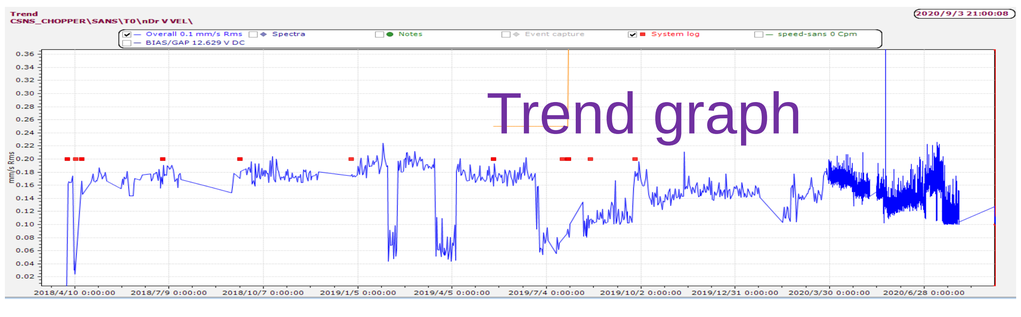
The system was put into operation in early 2018.

Every annual maintenance strategy was determined based on the vibration system datas.

Neutron chopper group of CSNS try to improve chopper design to reduce vibration for longer life.



HMI



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