

## Application Note

### POWER QUALITY MEASUREMENT FOR HARBOUR CRANES



#### *Power Quality And Its Importance*

Power quality refers to combination characteristics of voltage, frequency and waveform of power supply [1]. A good quality power refers to a clean sinusoidal waveform at 50 Hz or 60 Hz frequency without any sag or spikes. A bad power quality will cause the electrical devices to malfunction, fail prematurely or unable to operate at all. All these outcomes can pose safety risks as well as a high cost of repair or replacement.



A typical electric motor for cranes

#### *Power Quality Analyzer For Power Quality Issues Detection Of Harbour Cranes*

A crane is a type of machine used to lift heavy things, move them horizontally to a new position and lower it to a new desired position [2]. The main working equipment of a crane is the electric motor that drives the lifting work. Majority of electrical problems observed here is related to power quality issue during the loading and unloading phase of cranes. Therefore, it is vital to be able to detect the issues before they cause further damage.

The following power quality issues on the harbour cranes operation were detected using Hioki's Power Quality Analyzer PW3198 and PQ3100.



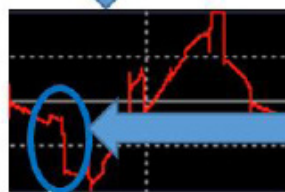
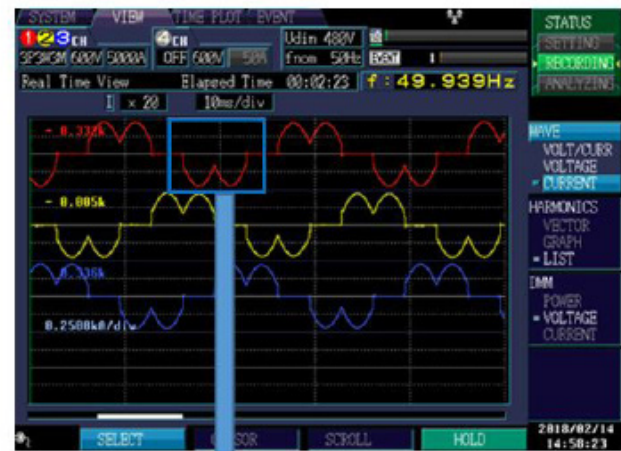
## 1. Instantaneous Voltage and Current reading (with PW3198 and PQ3100)

Figure 1.0 and 2.0 shows the detailed screen view of voltage and current characteristics respectively during crane lifting operation. It is noted that the instantaneous voltage and current spiked up from a fixed state whenever the crane lifts a load.

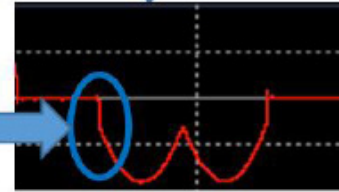
Figure 1.0 Detailed view of voltage



Figure 2.0 Detailed view of current



Sudden spike



## 2. RMS Voltage and Current (with PQ3100)

Figure 3.0 below is the RMS Trend for Voltage and Current crane operation using Hioki's PQ3100 Power Analyzer. RMS Voltage and Current spike are detected during the crane loading and unloading process. The continuous incident of the sudden spike in RMS Voltage and Current can shorten the lifespan of the crane's motor.

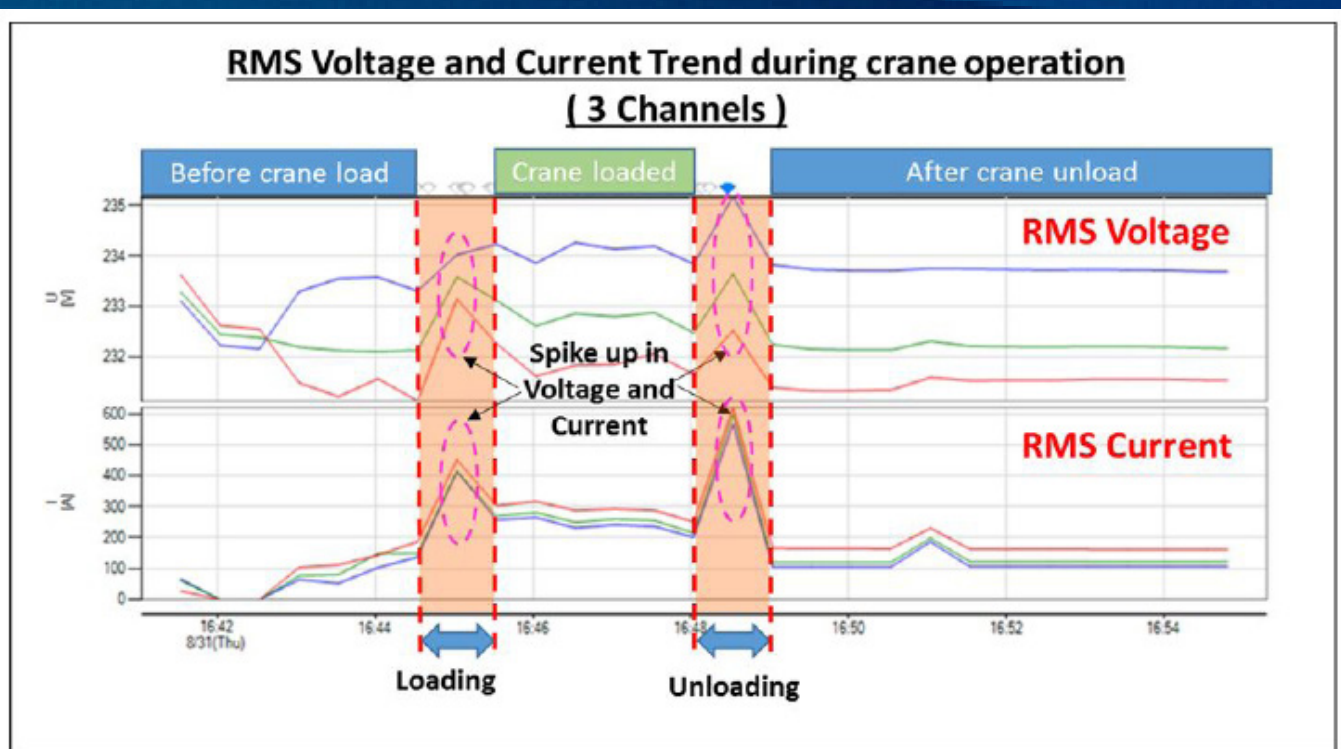


Figure 3.0: RMS Voltage and Current trend during crane operation

### 3. Harmonic Distortion

Figure 4.0 shows one channel of the harmonics data collected during the crane operation. Total Harmonics Distortion in Voltage (Uthd) was detected to be about 19-20%. This is out of the norm for the region's setting of under 5%. The high Uthd could possibly contribute to the high frequency of power tripping of the Protection Relay at the controls signalling

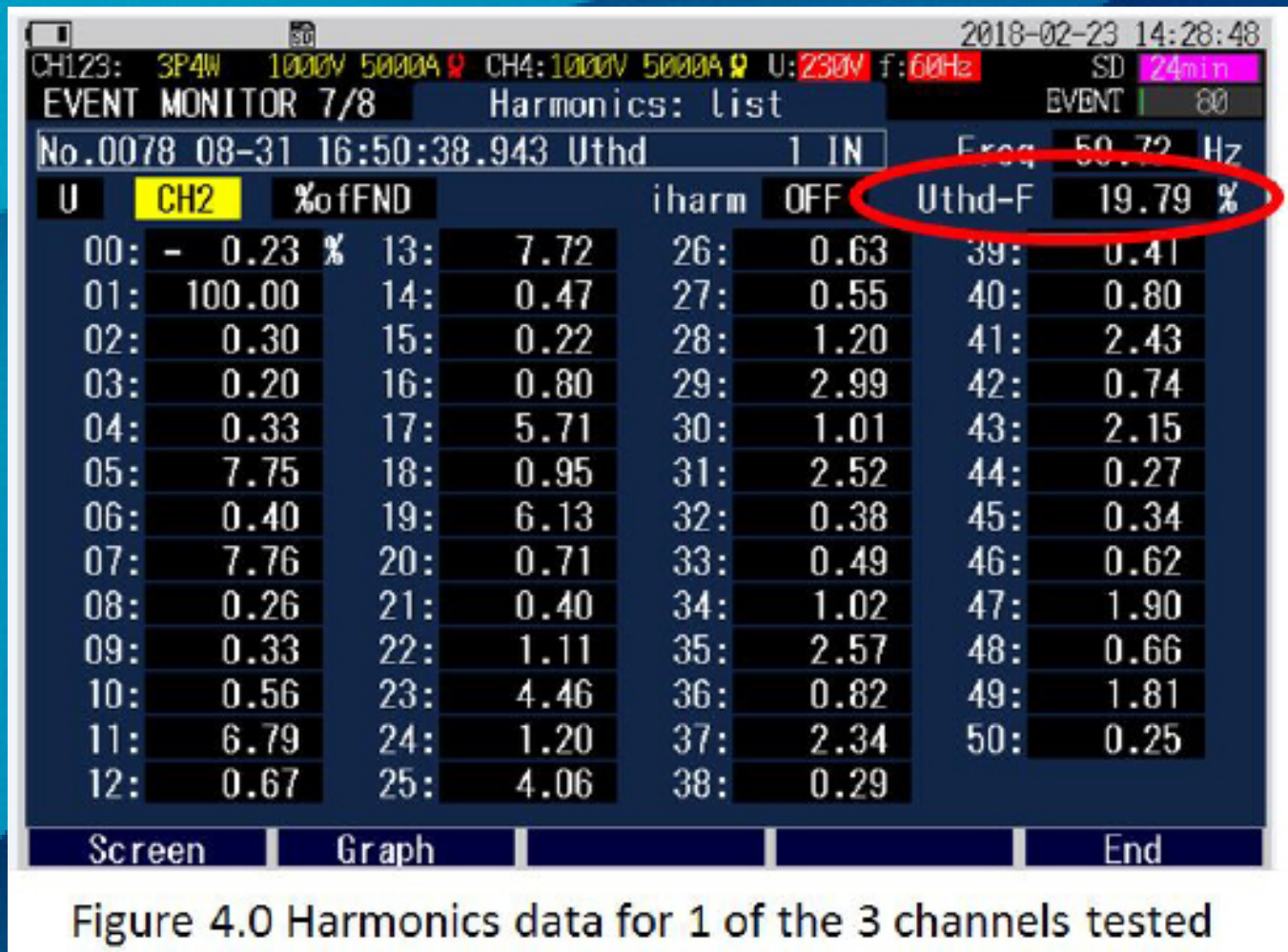


Figure 4.0 Harmonics data for 1 of the 3 channels tested

Crane operations are highly dependent on power quality. Hioki's Power Quality Analyzer PW3198 and PQ3100 can help to detect various power quality issues accurately to enable the right corrective action to tackle the problem.

### References

1. [https://en.wikipedia.org/wiki/Electric\\_power\\_quality](https://en.wikipedia.org/wiki/Electric_power_quality)
2. <https://en.wikipedia.org/wiki/Crane>