

How China's Largest Telecommunication Company is Leading the Way to Increased Product Reliability

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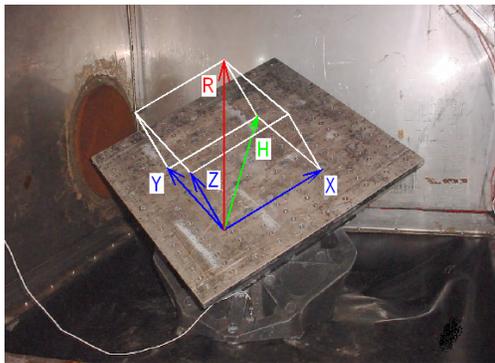
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ABSTRACT:

This article shows how China's largest telecommunication company is leading the way to improved product reliability. When Huawei experienced field failures on their products and could not duplicate the failures by conducting HALT tests on the pneumatic hammer system, they repeated the HALT tests on an electro-dynamic shaker with skewed fixture ESS system. Most of the vibration related defects were found in a much shorter test time and at significantly lower vibration intensity levels. Comparative results of testing on three different network blades with both ESS systems are presented in detail.

HUAWEI CASE STUDY:

After testing several hours of HALT on a pneumatic hammer system for up to 40 Grms vibration, Huawei's engineering team could not duplicate the vibration related problems in our Quidway NE Router we had been seeing in the field. We used Quanta Laboratories Electro-Dynamic Shaker with Skewed Fixture (reference 1) to perform HALT and duplicated all the problems found in the field at vibration levels of 5.0 and 7.5 Grms in just few minutes.



Skewed Fixture

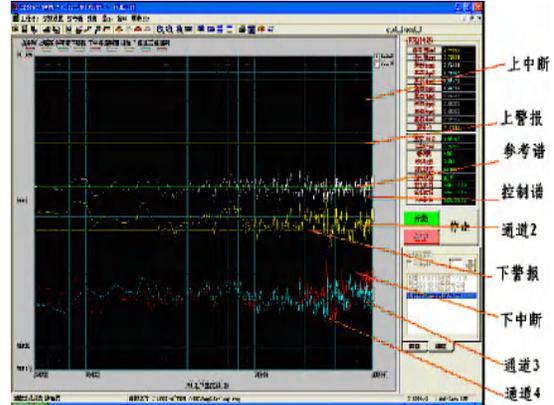


Network Blade on Quanta's ED Shaker/Chamber with Skewed Fixture

Because of this encouraging result, we conducted a series of tests to further evaluate the effectiveness of both ESS systems. We performed HALT on a total of 8 blades (three different types of network blades) on both the pneumatic hammer system and ED shaker with skewed fixture. Since the main difference between these two systems is in their vibration inputs to the test articles and in order not to introduce another stress factor, only vibration was used for these tests, with no temperature cycles imposed on them. Summary results of these tests are tabulated in the following tables.



Network blades on skewed ESS system at Huawei



Network blades spectrum

ESS Test System	Vibration Intensity Level (Grms)	Number of Problems Found at Each Level	Problems Found Related to Field Failures
Pneumatic Hammer System	5, 10, 15, 20, 25, 30	0	0
	35	2	1
	40	3	1
	Total	5	2
ED Shaker with Skewed Fixture System	2.5	8	5
	5.0	8	5
	7.5	14	11
	Total	30	21

Table 1: Test Summary of 3 Network Blades

For the three different blades, the pneumatic hammer system found 5 problems, 2 of which were related to actual failures. The electro-dynamic shaker with skewed fixture identified a total of 30 problems, including all problems found by the pneumatic hammer system. Of the 30 problems found, 21 of those problems were identified as actual field failures. Most vibration-caused field failures were successfully duplicated by the ED shaker with the skewed fixture. Test results for each of the blades are tabulated below.

ESS Test System	No of Blades Tested	Vibration Intensity Level (Grms)	Vibration Duration at each Level	Number of Problems Found	Problems Found Related to Field Failures
Pneumatic Hammer System	4	5, 10, 15, 20, 25, 30	10 min	0	0
		35		2	1
ED Shaker w/ Skewed Fixture	4	2.5	10 min	1	1
		5.0		2	1
		7.5		7	5

Table 2: Test Results - 10 Gigabit Ethernet Line Card

ESS Test System	No of Blades Tested	Vibration Intensity Level (Grms)	Vibration Duration at each Level	Number of Problems Found	Problems Found Related to Field Failures
Pneumatic Hammer System	2	10, 20, 30	10 min	0	0
		40		3	1
ED Shaker w/ Skewed Fixture	2	2.5	10 min	6	3
		5.0		4	3
		7.5		5	5

Table 3: Test Results - Gigabit Ethernet Line Card

ESS Test System	No of Blades Tested	Vibration Intensity Level (Grms)	Vibration Duration at each Level	Number of Problems Found	Problems Found Related to Field Failures
Pneumatic Hammer System	2	10, 20, 30	10 min	0	0
		40		0	0
ED Shaker w/ Skewed Fixture	2	2.5	10 min	1	1
		5.0		2	1
		7.5		2	1

Table 4: Test Results - POS Line Card

For all three blades tested, the results showed that the ED Shaker with Skewed Fixture was able to find problems at much lower Grms levels and in a much shorter time than the pneumatic hammer system. It also was able to identify more product weaknesses. Similar results were also found in other products (reference 1).

CONCLUSION:

While we can say that the ED Shaker with Skewed Fixture uncovered 6 times more problems (30 compared to the pneumatic hammer system of 5), the more impressive correlation is that the ED Shaker with Skewed fixture identified 21 field failures versus only 2 for the latter. This study has shown that the ED Shaker with Skewed Fixture seems to be more effective than the Pneumatic Hammer system for screening out product weaknesses. More importantly, the problems found by the ED shaker with skewed fixture have a higher correlation with field failures. This will allow us to better utilize our time and resources to fix real field failures.

Huawei is very interested in what percentage of the field failures this system can actually identify during HALT testing, and the potential cost savings this system may provide. To this end, a larger scale and more extensive study, including both vibration and temperature cycling is planned. We will report the findings of this study when it is completed.

REFERENCES:

1. Liu, Hong-Sun, "Comparison Testing of Shock Versus Vibration ESS system," TEST Engineering &

Management, Oct./Nov. 2007, pages 14-16.