International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Analysis and Minimizing Strategies for Conducted Emission for Packaging Machinery

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Abstract: ***The true objective of this research proposal is to investigate that how can we comply as per Table 2 class A Group. 1 equipment of CISPER 11:2015. [1]. Regulatory bodies around the world have placed limits on the levels of emission that electronic and electrical products can generate. [2] The conducted emission from the packaging machines had been measured with Artificial mains network ERDA (LISN) Line Impedance Stabilization and the Signal analyzer 9010 ERDA. The conducted emission levels were measured without Filter and EMC/EMI Filter. The noise EMC Test is used to determine the level of noise immunity and noise emission from the Electronic or Electrical product. Conducted emission is one of the tests of EMC Compliance.***

Keywords: Data acquisition, EUT, conducted emission Standards

1. Introduction

His paper describes that how packaging machines can be made EMC compliance. The need of electronic devices use in our daily life is increasing day by day. Electromagnetic disturbances are potential sources of malfunctions for all electronic equipment [4].So it is very important to understand the need of Electromagnetic compatibility and understanding. To comply with international market and to avoid recalls of products manufacturers ensures that electromagnetic disturbances are not interfering with the actual function of their products. The major issue is maintaining the quality and Safety of Packaging Machine.

EMC Test are used to determine the level of noise immunity and noise emission from the Electronic or Electrical product So Conducted emission is one of the test of EMC Compliance.

As we know the rising demand of Electrical goods in market and by the same time we want every product from day to night either eating or any other usage should be packaged safety. For many products and industries, EMC performance can mean the difference between life and death [2].This means there is number of increasing demands of machinery everywhere.

The test procedure followed as per Table 2 class A Group.1 equipment of CISPER 11:2015. [1] Only mains terminal disturbance (150KHz-30MHz) (Conducted Emission) test has been carried out on EUT.

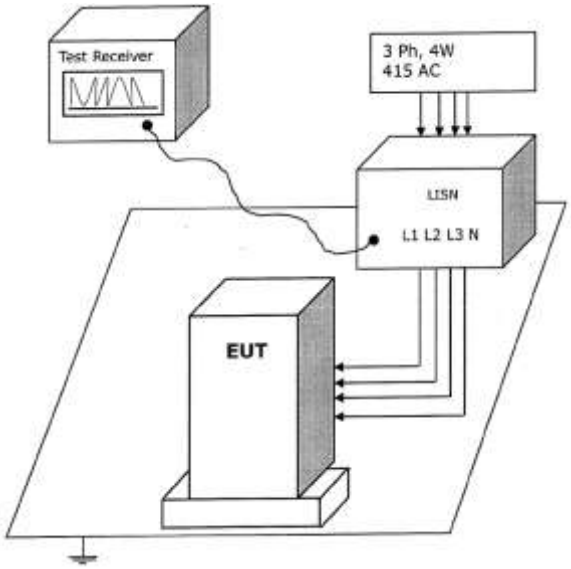

Figure 1: Test Setup Block Diagram

The Figure 1 shows the test setup block diagram for Mains terminal disturbance. Where EUT is Equipment under test. LISN Line impedance stabilization network is inserted between the three phase input and the EUT.

EUT is a type Packaging machine which operates with three phase. The machine is equipped with Power Panel and have HMI to operate.

2. Operating Procedure of Machine

Apply 3 phase 4 wire 415VAC±10%, 50Hz to EUT.

Switch on the main switch, MPCB (Motor Protection Circuit Breaker), RCCB (Residual Current Circuit Breaker) and MCCB (Molded Case Circuit Breaker).Now switch on all MCB one by one. As soon as machine gets power. The touch screen (HMI) will display welcome message as well as various functions. Press start on HMI, to start the machine.

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➢ **Operating condition of EUT during the Test:**

- EUT Tested in 'Auto Mode'
- Test carried out with Laminate and with product.
- Set machine speed 100stroke /min.
- Temperature set as per the laminate thickness material.

➢ **Performance criteria :**

Functionality of EUT should be checked before the test as follows:

- HMI display on EUT should not garbage, hang and reset.
- Beacon light indication should remain green.
- No alarm should be generated on HMI.
- Machine Speed: 100.
- Sachet Count: 10.
- Hopper Filling Stroke: 15.0 Degree.

➢ **Acceptance criteria for this machines as per requirement**:

As per Table 2-Class A Group.1 equipment of CISPR 11:2015[1]

Frequency Range	**Rated Power of >20KVA and ≤ 75 KVA** [a, c]	
	Quasi-peak dB(μV)	Average dB(μV)
0.15 MHz-0.50 MHz	100	90
0.50 MHz-5 MHz	86	76
5 MHz-30 MHz	90 decreasing linearly with logarithm of frequency to 73	80 decreasing linearly with logarithm of frequency to 60

Table 1: (Table 2-Class A Group.1 equipment of CISPR 11:2015)

To perform the test on EUT the major equipments used i) Artificial Mains Network ERDA (LISN) Line Impedance Stabilization with specification 9KHz - 30MHz. ii) Signal Analyzer 9010 ERDA with specification 10Hz to 30 MHz.

Receiver setting during the test is mentioned below:

Receiver Settings		Frequencies
Start KHz	150	
Stop KHz	30	
Step KHz	5	
IF BW KHz 9		
Detector: Quasi-Peak and Average.		

Terminal Voltage limits for 0.15 MHz to 30MHz for Quasi-peak and Average Values are shown in Figure 1 and 2.

The Equipment under Test is energized and operated as per the specified criteria mentioned in **(II) Operating Procedure of machine:**

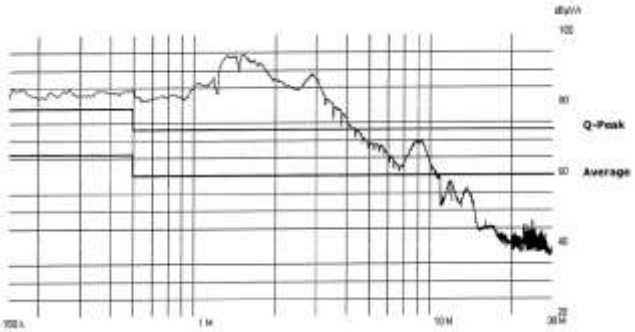

Figure 2: Quasi-peak & Average Limits and Obtained Quasi-peak at mains terminals of conducted emission.

The Quasi-peak values measured at the mains terminals disturbance voltage measurement from 0.15MHz to 30MHz is shown in figure 2 which is more than specified limits.

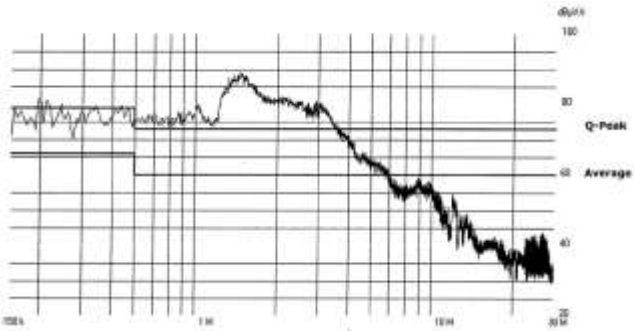

Figure 3: Quasi-peak & Average Limits and Obtained Average at mains terminals of conducted emission.

The Average values measured at the mains terminals disturbance voltage measurement from 0.15MHz to 30MHz is shown in figure 3 which is more than specified limits.

3. Minimizing Strategies for conducted Emission

So to reduce the conducted emission levels one strategy is to use the EMC/EMI Line filter, which is three-phase and neutral line filter for general four wiring filter with low operating leakage current and compliant with IEC 60950.And suitable to meet EN55011/14/22.[3]

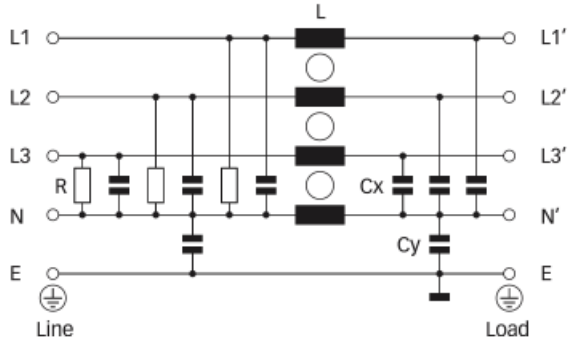

Figure 4: Typical Electrical Schematic of EMC/EMI Filter

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4. Observation / Results for Conducted Emission

EMC/EMI Filter had been used in three-phase power supply with neutral and applied 3 phase 4 wire 415VAC±10%, 50Hz to EUT.

All operating procedure, operating condition, Performance condition and acceptance criteria checked.

The results found within the limits.

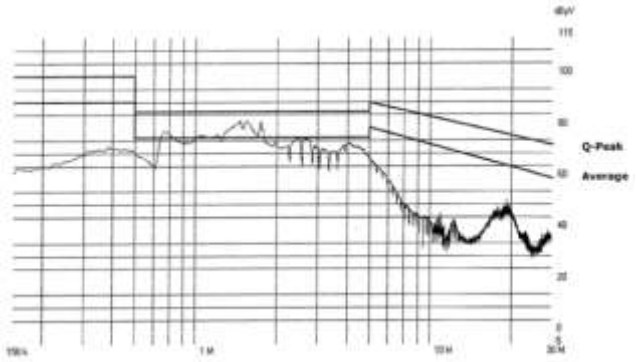

Figure 5: Quasi-peak & Average Limits and Obtained Quasi-peak at mains terminals of conducted emission after adding Filter

The Quasi-peak values measured at the mains terminals disturbance voltage measurement from 0.15MHz to 30MHz is shown in figure 2 which is less than specified limits.

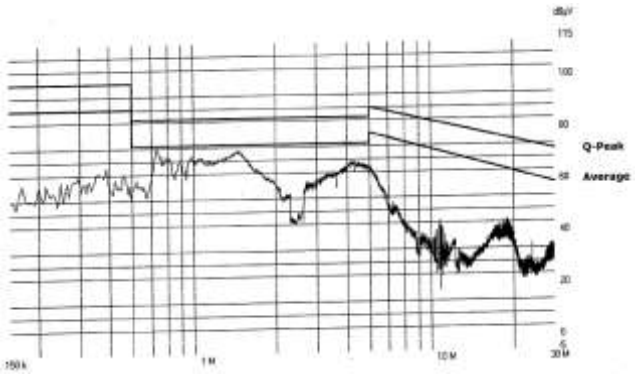

Figure 6: Quasi-peak & Average Limits and Obtained Average at mains terminals of conducted emission after adding Filter

The Average values measured at the mains terminals disturbance voltage measurement from 0.15MHz to 30MHz is shown in figure 3 which is more than specified limits.

5. Conclusion

The conducted emission/ mains terminal disturbance measured in dB (μV) at various frequencies in range (150 KHz-30MHz) for packaging machines with and without Filter. It is observed that after using filter we got conformance with Table 2-Class A Group.1 equipment of CISPR 11:2015[1].

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Author Profile

Poonam was born in India and received her Bachelor degree (Instrumentation and Control Engineering) from Kurukshetra University, Haryana and M.Tech degree in ECE from MDU, ROTAK India. She has worked as Assistant Professor in Manav Racha University, Faridabad from 2010 -2014.Currently she is currently working as Assistant Manager with Packaging Industry in Faridabad, India. Her area of interest is EMC/EMI. She is member of IEEE.

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