

CASE STUDY

United States of America

Defence

L-3 Communications Power Magnetics Measuring Transformer Noise and Vibration

PULSE, transducers, calibrators

Power Magnetics is a part of SPD Technologies, a division of L-3 Communications Corporation. Based in Gardena, California, the company specialises in the design and construction of power transformers that are sold for use in aircraft and marine vessels in the military and private sectors, to OEMs, for use in the offshore oil industry, and in other markets.

The company's relationship with Brüel & Kjær dates back to the late 1980s. A PULSE™ system with a 6/1-channel front-end has been recently acquired and is used to measure the noise and vibration characteristics of transformers.



History

L-3 Communications is a leading supplier of secure communications systems and products, microwave components, avionics and ocean systems, telemetry, instrumentation, space and wireless products. Based in New York, and with over 23000 employees, L-3 Communications serves the Department of Defense, select U.S. Government intelligence agencies, aerospace and defense prime contractors, and commercial telecommunication and cellular customers.

L-3 Power Magnetics' technical expertise is the result of its over 80 years experience designing and manufacturing ruggedized power transformers for commercial and military applications. As part of SPD Technologies, the company is able to utilise the complete resources of SPD Technologies and its subsidiaries. With a facility in Gardena, California, the company employs some 60 people.

Products

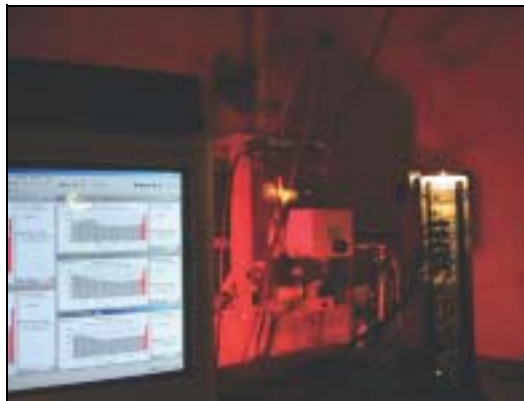
Fig. 1
Every L-3 Power
Magnetics
transformer
undergoes
thorough testing



L-3 Communications Power Magnetics serves customers in both the military and private sectors. The company specialises in the design and construction of air- and water-cooled power transformers of either open or closed configuration. Its products perform vital roles in such varied environments as military and marine vessels, OEMs, offshore oil rigs and the data center market.

L-3 Power Magnetics is one of the most qualified transformer manufacturers in the world to meet the wide range of special requirements unique to military standards, including shock, low noise, size and weight, special voltages and impedances and MIL-T-27 applications. Its power components are in evidence aboard every United States Navy surface ship and nuclear submarine launched since World War II.

Fig. 2
NVH testing in the
specially built test
room



Single-phase and three-phase standard and custom-designed distribution transformers from 0.1 kVA to 8000 kVA are produced in quantities from one to several hundred. Enclosed-construction models are available in encapsulated, explosion proof or any NEMA-grade enclosure. Every product developed and manufactured by L-3 Power Magnetics meets stringent quality standards.

The company manufactures water-cooled transformers for applications that demand high power such as rectifiers, plating, welding and power distribution. The company also manufactures pulse width modulation (PWM) and rectifier transformers for all ANSI rectifier circuits.

It is perhaps best known for its “deep” engineering expertise in all aspects of magnetics technology. As the world leader in non-linear loading transformers, L-3 Power Magnetics has an unmatched reputation for quickly meeting complex power-technology assignments and fulfilling even the most difficult delivery schedules. Lead times are often as low as 2 weeks.

Quality Control

L-3 Power Magnetics has a decades-old reputation for product quality, adhering to rigorous quality management and demand-flow technology (DFT) practices at its 60 000 square foot (5575 m²) ISO 9001:2000 approved facility. The company is also approved by UL (Underwriters Laboratories), CSA (Canadian Standards Association) and ABS (American Bureau of Shipbuilding). From a product's design right through to its final installation, L-3 Power Magnetics engineers work closely with customers to develop magnetic solutions that will meet the applications' exact requirements.

Fig. 3
Carl R. Kunreuther
is L-3 Power
Magnetics Quality
Assurance Manager



Carl R. Kunreuther is Quality Assurance Manager. Has been at L-3 Power Magnetics for more than 25 years. He devised and implemented the quality assurance program – in fact he has been involved with quality control his whole working life, and previously worked at McDonnell Douglas. Carl has a degree from UCLA. He is responsible for all inspection and testing procedures at L-3 Power Magnetics.

Carl says, “The sound and vibration characteristics of our products are becoming increasingly important. Generally, the customer specifies the required maximum levels after discussion with us. The noise and vibration parameters vary according to the end-use of the particular transformer. Testing is carried out in a specially built sound-proofed room and every product is 100% tested before being dipped and baked”.

Testing

The sound-proofed room for quiet tests measures 16 × 20 × 12 feet (4.88 × 6.10 × 3.66 m) and is specially built to military standards. The ambient noise level is less than 40 dB. L-3 Power Magnetics transformers are designed to overcome all common-mode noise problems from 55 dB to 120 dB. Units are single-, double- or even triple-shielded, based upon the requirements of the application.

L-3 Power Magnetics United States Navy transformers have QPL listing (Qualified Product List). With transformers for military applications, the relevant US Government Agency decides which MIL standards should be applied, dependent on the use of the transformer.

Carl explains, “Our relationship with Brüel & Kjær goes back to the late 1980s. We originally used a Type 2515 Analyzer but stopped using this in about 1993 when we bought a Type 2143 Real-time Frequency Analyzer. This is still working fine and we use it from time-to-time”.

Fig. 4
L-3 Power
Magnetics has a
wide range of
Brüel & Kjær
equipment



He continues, “We recently decided to buy a PULSE™ system with a 6/1-channel front-end. Noise testing requires five microphones (Brüel & Kjær Type 4165) that are centred one metre away from the transformer. We measure the sound pressure level and also make 1/3-octave analysis. For vibration testing we use either two triaxial accelerometers or twelve Type 4384 V accelerometers and carry out 1/3-octave and FFT analysis with 1 Hz resolution. The frequency range of interest is very wide – from 10 Hz up to 16 kHz and beyond”.

The transducers are calibrated before every test. Brüel & Kjær calibrators are used – a Type 4294 for the accelerometers and a Type 4230 for the microphones.

L-3 Power Magnetics has a number of Brüel & Kjær NEXUS and Type 2626 and 2635 Conditioning Amplifiers. These are soon to be replaced with Type 2647 In-line Charge Amplifiers. It also has a Type 2811 Multiplexer for use with the Type 2143 Analyzer.

Fig. 5
Saba A. Saba is
Power Magnetic's
Applications
Manager

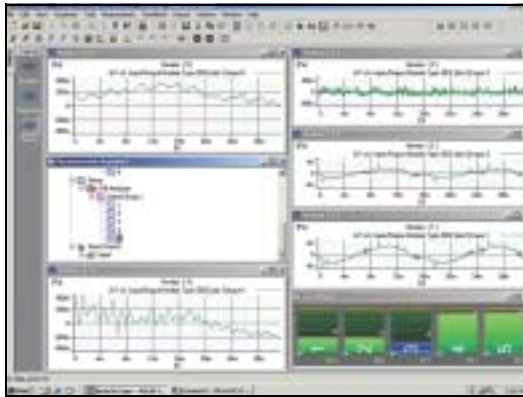


Saba A. Saba is Power Magnetic's Applications Manager. He is the "interface" between the customer and Power Magnetic's engineers. Saba has a degree in electrical engineering and has worked at Power Magnetics for more than fifteen years.

Saba says, "Noise and vibration are important issues, especially with our military customers. We are very excited about the possibilities of using PULSE".

Data Handling and Reporting

Fig. 6
Display showing
the setup of five
microphones prior
to 1/3-octave CPB
analysis. The level
meter is shown in
the lower right-
hand corner



Test data is exported to Microsoft® Word. Reports are also made in Excel. Test data is retained permanently. It is kept on a central server and also backed up on CD.

Carl says, "It is very useful to be able to easily compare data, and this is easy with PULSE. Generally, the customer specifies the noise and vibration parameters. When the tests are completed, the reports are made and sent to the customer".

He adds, "We sometimes produce as many as 40 different transformer designs in a single week. Each has to be tested and it's useful for us to be able to make our own PULSE templates for each test project".

Carl concludes, "I think PULSE is a versatile instrument with a lot of capabilities. We benefit from shorter testing times – in the past we had to measure one channel at a time, and twice in each position, but now we can test six times faster, reporting is easier, and we are totally confident in the accuracy of the data. And we are very pleased with Brüel & Kjær's training and support. The next step is to use it for noise source identification".

Key Facts

- Power Magnetics is a part of SPD Technologies, a division of L-3 Communications Corporation
- The company has more than 80 years experience manufacturing ruggedized power transformers for commercial and military applications
- "The sound and vibration characteristics of our products are becoming increasingly important"
- "We recently decided to buy a PULSE™ system with a 6/1-channel front-end"