

Safe Energy S.r.l.



EMC, Power Quality and Energy Solutions

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Safe Energy, with its broad range of products and services, is the ideal partner for all the Companies that need to understand and consequently solve EMC and Power Quality issues.

EMC (Electromagnetic Compatibility) and Power Quality are complex and constantly evolving topics.

The huge increase of installations of power electronics generates a substantial raise of power demand and the susceptibility of electrical and electronic devices to high and low frequency interferences have identified Electromagnetic Compatibility and Power Quality as mandatory topics starting from the very first stage of new devices design-in

Safe Energy offers its own competence through:

A dedicated and focused **technical service** for:

- ✚ **Harmonic Distortion Test in the power grid**
- ✚ **Test of sinus wave quality to the motors**
- ✚ **Conducted Emission Test**
- ✚ **Technical Assistance during all the development stages of a new device**

and a **product portfolio** of:

- ❖ **Harmonics Filters**
- ❖ **Sinus Filters**
- ❖ **EMI Filters**

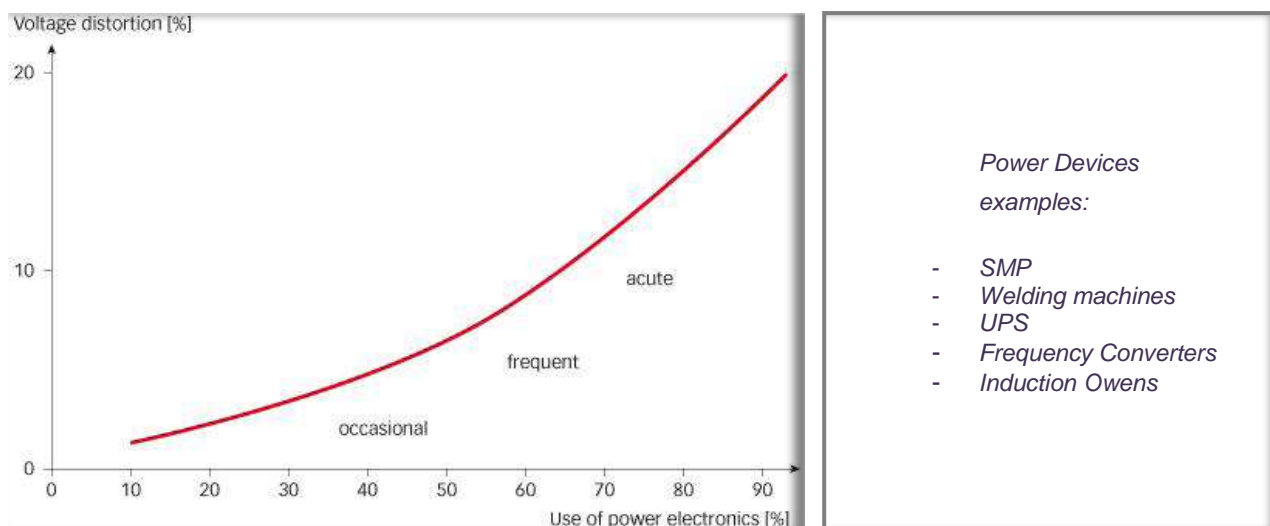
selected and optimized after our scientific approach with the goal to be both technically in line with the customer expectations and cost effective as well



POWER QUALITY

The poor Power Quality can be the cause of bringing some plants into critical operational areas because of Current Harmonic Distortion and the relative reduced energy availability due to phase shift, unbalanced loads, transformers losses and residual currents on the neutral.

In Germany it has been estimated that the damages generated by incidental production stops in a plant due to Power Quality problems, are evaluated in the order of some billion Euro every year.



Safe Energy contributes to the significant improvement of Power Quality by bringing back to a safety area the relevant values of the electrical parameters regarding the main interference sources and harmonic distortion, increasing grid efficiency and saving energy consumption.

Total Harmonic Distortion: "THD" is the ratio between the RMS value of the harmonics and the RMS value of the fundamental.

$$THD_{(V)} = \sqrt{\sum_{n=2}^{40} \left(\frac{V_n}{V_1} \right)^2} \quad THD_{(I)} = \sqrt{\sum_{n=2}^{40} \left(\frac{I_n}{I_1} \right)^2}$$

Power Factor: the power factor indicates the system efficiency under AC power. it is defined as the ratio between real power and apparent power and is simplified in the following formula:

$$PF = \frac{I_{1 \text{ rms}}}{I_{\text{ rms}}} \cdot \cos\varphi$$

$I_{1 \text{ rms}}$: rms value of the fundamental current
 $I_{\text{ rms}}$: rms value of the total current, including harmonics and distortions.

MOTORS PROTECTION



Caused by the increase of the performances of Motor Drives, AC motors are constantly stressed and the efficient way to protect them is becoming an important aspect in the context of the reduction of operating costs.

Safe Energy is able to increase the motors service life through the installation of components to convert the PWM output signal of the Motor Drive, into a sinus signal with low residual ripple for the benefit and reliability of important and complex systems like:

- HVAC and Compressors
- Pumps and Fans
- Cranes
- Elevators and Lifts
- Multi Motors drives
- Motor Drives with long motor-cables
- Motor upgrade with new Drives
- Oil & Gas Plants
- Renewable Energy
- Heavy Industry in general



CONDUCTED EMISSIONS

The electromagnetic emissions can be generated intentionally during information transmission or during some specific industrial processes.

The electromagnetic emissions, not intentionally generated, that flow through the power line and also through the power transformers on different voltage values, are considered interferences. Those interferences can downsize the performance devices in a plant and therefore be the main reason of a failure. The Equipment Manufacturer, the System Integrator and / or the Plant Assembler, have to pursue the appropriate measures to reduce the levels of electromagnetic emissions in order to respect the interference limits set up by the international specifications

Safe Energy is the ideal partner to solve these issues, improving the reliability, safety and energy optimization of the whole electrical / electronic system.

The Test Service offered by **Safe Energy** is the tool to fully understand the undesirable problems generated by non-linear loads and is able to address the Customer to the most effective technical solution selected from the portfolio of the best filter Manufacturers specialized in interference suppression, motors protection and harmonic mitigation.

Safe Energy is available with a fully equipped mobile lab and offers its services directly on Customer site.

The Test Report of the measurement activity provided by **Safe Energy** is a valuable support for a proper preparation of the declaration of conformity to European Directives and the CE mark.

| LF | | | HF | | | | |
|----------------------|---------------|-------------------------|--------------------------------------|----------------|-------------|------------|-------------|
| 50hz (60hz) | 2,5Khz (3Khz) | banda non regolamentata | banda A | banda B | banda C | banda D | banda E |
| Armoniche | | | 9Khz | 150Khz | 30Mhz | 300Mhz | 1Ghz 18Ghz |
| Power Quality | | | Elettromagnetic Compatibility | | | | |
| Generazione | | | Loran | Radio AM | Radio FM | UHF | Ponti Radio |
| Distribuzione | | | | Forni | VHF | Cellulari | Satellitari |
| Impanti Civili | | | | Saldatrici | Cordless | Radar | Radar |
| Impianti Industriali | | | | Essiccatori | Radiomobili | Telemetria | |
| | | | | Sterilizzatori | OM | | |
| | | | | | CB | | |

Ranges of frequencies governed by the regulations

**Safe Energy offers competitive solutions for all the problems of
EMC and Power Quality**

EUROPEAN DIRECTIVE 2014/30/EU: Electro-Magnetic Compatibility

Electromagnetic Compatibility is the ability of a device or a system to properly work in its environment without producing Electromagnetic Disturbances. The European EMC Directive 2004/108/EC, implemented by Legislative Decree No. 6/11/2007. 194 of the Italian Republic, regulates the Electromagnetic Compatibility of equipment and prescribes compliance with the goal to put it on the market, start/set it up and the consequent commercial trade.

The main electromagnetic phenomena treated by the Directive are:

- ✚ High-Frequency Conducted Emissions
- ✚ Harmonics, Voltage Fluctuations, Dips and Voltage Interruptions, Phase Shift, Frequency Variations
- ✚ Conducted and Radiated Transient
- ✚ High-Frequency Radiated Field
- ✚ Electric and Magnetic Fields
- ✚ ESD

Normative References related to HF Conducted Emissions

- | | |
|--|-------------|
| - Scientific Instruments | EN55011 |
| - Radio, TV, players, amplifiers, multimedia devices | EN55032 |
| - Appliances and portable instruments | EN55014-1 |
| - Lighting | EN55015 |
| - UPS | EN62040-2 |
| - Machine tools | EN50370-1 |
| - Power supply voltage direct current | EN61204-3 |
| - Electrical Variable Speed Power Drive | EN61800-3 |
| - Generic standards for residential and light industry | EN61000-6-3 |
| - Generic standards for industrial environments | EN61000-6-4 |

Normative References related to LF Conducted Emissions

- | | |
|---|--------------|
| - Limits for harmonic currents for devices with $I < 16A$ | EN61000-3-2 |
| - Limits for harmonic currents for devices with $16A < I < 75A$ | EN61000-3-12 |

Standardization Bodies for Electromagnetic Compatibility:

- | | |
|----------------|---|
| IEC | International Electrotechnical Commission |
| CENELEC | European Committee for Electrotechnical Standardization |
| CEI | Comitato Elettrotecnico Italiano |

Standards:

- Product : rules are dedicated to specific product categories
- General : are adopted in the absence of product standards
- Basic : define how to measure, the criteria for the definition of the electromagnetic environments and are the reference for product standards and general standards