



## European Power Quality Survey

## CHEMICAL INDUSTRY

# CHEMICAL PLANTS SUFFER FROM INADEQUATE POWER SUPPLY

Energy costs are an increasingly significant burden for the Chemicals sector. Whilst the pricing of already high costs for oil, natural gas, and electricity are out of the sector's control, the cost of energy does not stop at signing the annual energy contract. Many chemical plants incur significant financial losses due to electrical power systems that cannot cope with commonly experienced irregularities in the power supply. In some cases, these unplanned losses represent the difference between making a profit or making a loss.

## ELECTRIC SYSTEMS SOURCE OF HIGH FINANCIAL LOSSES

The European Copper Institute's Power Quality (PQ) Survey questioned whether the sector's own electrical power systems are adequately designed to withstand such common power interruptions and disturbances.

### Wide ranging financial losses caused by inadequate PQ

Power interruptions of less than a second can bring a production plant to a halt. The immediate consequences are:

- ▶ **Equipment damage**
- ▶ **Wasted Work In Progress** and raw materials
- ▶ **Wasted man-hours** between stoppage and re-start
- ▶ **Extensive additional maintenance efforts** to clean the system of partially processed production

These impacts usually trigger a whole range of **penalties** – environmental, utility, client contract, and personnel claims. These unexpected stoppages disrupt production planning and usually result in **delivery delays**, loss of reputation for reliability and consequently loss of business.

Sudden voltage increases (also called “voltage surges”) can be equally dangerous. They can cause control equipment to overheat with **potentially disastrous consequences for the integrity of the plant**. These in turn can lead to damaged capital assets and often as not to environmental or Health & Safety incidents. The severity of the penalties and insurance premiums increase in these cases are well known to be punishing.

Another main problem is that these losses, again according to the Survey, **tend not to be assessed as a totality**, relating as they do to different cost centres and occurring at different moments in time.





**Short interruptions to power supply, even as short as a millisecond, can stop a production plant**

**For some chemical plants, Power Quality (PQ) losses represent the difference between making a profit or a loss**

#### **Understanding the problems – designing the solutions**

ECI's PQ Survey demonstrates that the majority of the Power Quality problems faced by the chemical industry result from the end users' own electrical installations' inadequate design. The solutions therefore lie very much in the industry's own hands.

Electrical design engineers involved in this survey recommend a holistic approach to review all the issues at hand, based on three operational pillars:

- **Correct measurement**, to assess the full impact of power quality events, and why they are happening.
- **Appropriate design** for the electric installations, ensuring reliability and resilience.
- **Considered investment** justified by assessing system renovation cost set against the accumulated losses.

#### **A WEEK'S LOST PRODUCTION CAUSED BY 5 SECONDS' POWER FAILURE**

At this chemical plant, a contactor failed for just under 6 seconds. Controls and operational equipment were affected, leading to an entire week's production being halted. The losses included lost production, staff downtime, wasted raw materials, equipment damage and penalties to the electrical network operator. The aggregated cost to the company was just under €7.8 million.

In the same production plant, the cost of a very short interruption or "voltage dip", provoking a so-called "brown-out", was calculated to be over €700,000.

#### **EQUIPMENT FIRE CAUSED BY A VOLTAGE SURGE**

A power surge started a fire in certain elements of the electrical installation causing the plant's cooling system to fail. The resulting overheating damaged capital assets, created significant environmental consequences and the event was declared a "Health & Safety Incident".

The cost of this avoidable event was calculated to be €1.4 million, consisting of staff downtime, equipment damage, irrevocably lost revenue, energy supplier penalties, environmental penalties and increased insurance premiums.

#### **PQ ISSUES PUSH COMPANY INTO THE RED**

A fertilizer plant was protected against long power interruptions that have the potential to close the site down. However the consequences of other PQ issues like short interruptions, voltage dips and voltage surges were still significant enough to create an annual loss of €3.6 million. This wastage approximated the company's national annual financial losses. Put another way: without those PQ losses, they would have made a profit.

These losses consisted mainly of lost revenue, staff downtime, additional logistical costs and contractual penalties. Not quantified but recognised was the potential loss of reputation as a reliable supplier.

#### **PROFITABLE INVESTMENT OPPORTUNITIES**

The chemical sector suffers unnecessary financial losses caused by their own electrical power systems that often cannot cope with a variable electric power supply. ECI's Survey has identified many losses and much wastage due to poor PQ throughout the industry's different production centres. It has demonstrated that PQ solutions often cost less than the financial losses they resolve.

Whilst current investment into PQ solutions for the companies interviewed was 3.5% of the average turnover, the average losses caused by unresolved PQ issues accounted for over 10% of their annual electricity bill.

#### **Do you know what PQ is costing your organization?**

**Your engineering management can contact us at <http://contact.leonardo-energy.org> to find out how the issues raised here may be affecting your company.**