

# FINDING THE SOURCE OF THE FLICKERING LIGHTS

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Flicker is the perceived change in light output from a lamp, caused by the fluctuation of the supply voltage at an office, factory, or residential home. The source can be from short duration disturbances, such as spot welders and motor starts, or longer duration disturbances, such as electric arc furnaces. As little as a quarter of a percent voltage fluctuation at 9Hz can be perceived as light flicker.

While flickering isn't a new power quality phenomena, it has been receiving more attention lately, as electric utilities continue to become more customer-service oriented. Since

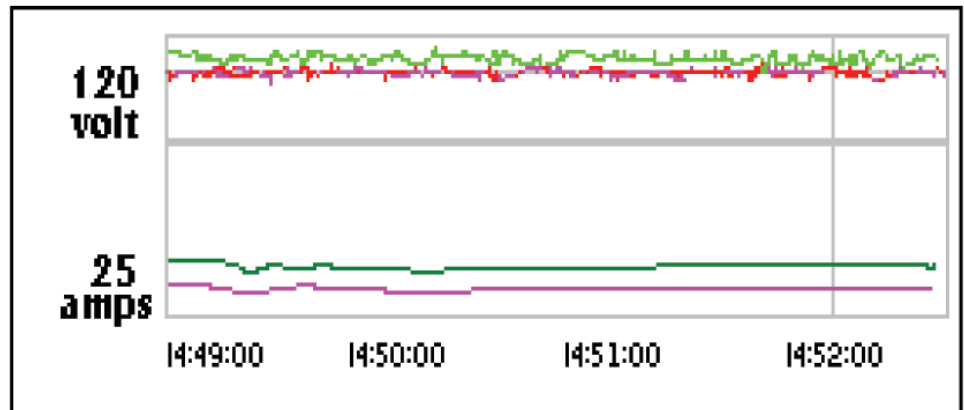


Figure 1 – Timeplot of Voltage and Current.

flicker generally does not interrupt a process or cause equipment failures, it hasn't received the attention that sags, harmonics and transients have.

However, as businesses realize that their employees are their most valuable assets, keeping those "knowledge assets" running at full productivity is increasingly important.

Like analysis of sags, determining if the monitoring point is upstream or downstream from a flickering source is usually the first step in trying to find the source. It can be determined most times by examining the variation in the magnitude of the current change at the time that the voltage was fluctuating. If there is very little current change relative to the voltage change, then the disturber is probably upstream from the monitoring point. Conversely, a large change in current accompanied by the voltage fluctuation would point to the disturber being downstream from the monitoring point. The following case study illustrates this.

## CASE STUDY

The monitoring was done in the second floor of an end unit of an office-condo complex in the Washington DC area. The office space consisted of a reception and meeting area, two private offices, a kitchen area and a bathroom. Entire area was powered from a single three-phase 208/120V wye feed from transformer bank located right below and outside the office. A light flicker problem had been noticeable for a number of years. It was most visible in the bathroom and outside hallway.

The source was undetermined, though HVAC units on the roof were suspected.

Monitoring was done for only a couple of minutes before the direction of the disturber was determined. The voltage of the one phase varied between 118.3 and 126.3Vrms, while the current varied 23.4-26.8 Arms. Other phases varied from 115.3V-123.3Vrms while the current varied 17.2-19.4 Arms. The load impedance was fairly constant (5 ohms phase A, 6 ohms phase B).

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Source impedance was changing significantly (0.4-0.5 variation in ohms on both phases). There was very little change in current levels for the resulting voltage fluctuations. Hence, the disturber was in the direction of the source or voltage supply side. Since the monitoring was being done at the breaker panel, the source of the flicker was determined to be upstream, or outside the building.

The graph on the previous page shows the two voltages in the top of the timeplot, and the currents in the bottom of the same plot.

The waveforms of the voltage and current are shown below, with the voltage being the larger waveform. The variation in the voltage waveform is most apparent in the bottom half of the picture.

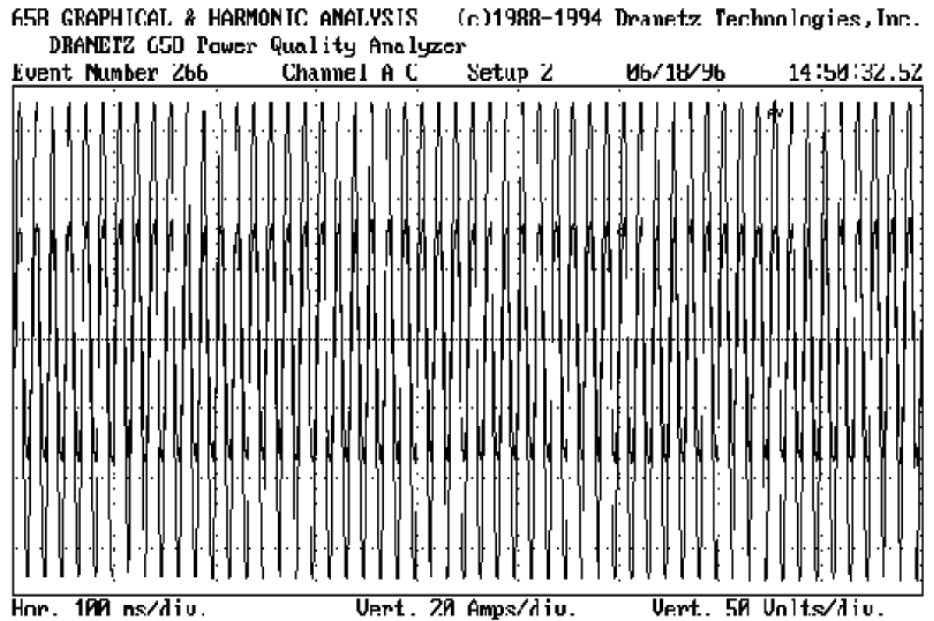


Figure 2 – Voltage and Current Waveforms.

## CEA WELCOMES EFFICIENCY MEASURES

As part of its new suite of ecoENERGY Initiatives, the federal government unveiled an Energy Efficiency program that is being welcomed by the Canadian Electricity Association.

Announced by Natural Resources Minister Gary Lunn the ecoENERGY Efficiency Initiative will contribute \$300 million over four years to help build a conservation culture in Canada.

“CEA member companies have been successfully delivering energy efficiency programming for over a decade to assist customers in managing their electricity consumption,” said Hans Konow, CEA President and Chief Executive Officer. “The availability of additional options to help customers shape their energy behaviour and consumption patterns is welcomed by the industry.”

The federal government also revealed the ecoEnergy Technology and ecoEnergy Renewable initiatives, both of which were commended by the electricity industry. The \$230 million federal funding available for partnerships in the research, development and demon-

stration of clean-energy technologies supports further development of clean coal, carbon sequestration and renewable energy initiatives.

Emerging renewables and in particular wind generation are increasing in importance both for their benefits in achieving fuel diversity and in minimizing environmental impacts. The \$1.5 billion EcoEnergy Renewable initiative will help support continuing emerging renewables development.

“Increased federal funding of clean energy science and technology, emerging renewable energy and energy efficiency measures are critical components of securing a strong, diversified and sustainable electricity future in Canada”, said Mr. Konow. “CEA member companies are strong proponents of government and industry partnerships to enhance electricity sustainability, improve energy security and help customers manage their electricity bills.”

CEA believes that energy efficiency and emerging renewable generation are important elements in a comprehensive

and holistic approach to meeting our country’s electricity needs. Maximizing the benefits of conventional generation and emerging renewable technology, and focusing on demand reduction through energy efficiency are all required to ensure a safe, secure, reliable, sustainable and competitively priced supply of electricity in the near and long-term.

In order to optimize the potential of Canada’s electricity system, the Association has developed and is currently promoting a five point plan:

1. Establish an investment climate to ensure future electricity supply;
2. Move government and industry towards efficient and effective regulation;
3. Work to ensure a sustainable future for the next generation;
4. Foster innovation and accelerate skills development;
5. Build on the strengths of the integrated North American system to maximize opportunity for Canadians.