BY WINSTON (KIP) SCOVILLE

Savvy power factor correction yields savings

In May of 2016, Cos Phi was contacted to analyze the hydro demand usage for Commercial Print Craft in Woodstock, Ontario, for the purpose of reviewing options to make their facility more energy efficient. A Cos Phi technician conducted a site survey to gather and record all the pertinent information about the electrical system required to determine a course of action to move forward.

A hydro billing analysis based on the most recent 12 months of billing data was conducted. The billing analysis shows trends in demand and the costs paid. The analysis would be used as an initial baseline for the project.

The hydro billing analysis of the facility concluded that the electrical systems power factor[1], a measure of efficiency, was very poor and ranged from 65.8 per cent to 75.1 per cent. This power factor range is consistent with this type of industry when there is no, or very little power factor correction already installed. Ideally, you would like to see the power factor at 95 per cent or above. It has been the common practice over the years however, mostly for economic reasons, to simply correct the power factor to avoid costly demand penalties. The level of correction required to avoid penalties varies from utility to utility.

The hydro company's utility rate structure, in this case, states that demand rates are to be applied to either the peak kW reading or 90 per cent of the corresponding kVA reading during the billing period, whichever is largest.

This would mean that every time the power factor of the facility fell below 90 per cent the rates were being applied to the much larger kVA reading (which occurred during every single billing period), thus the facility was being assessed an avoidable penalty due to poor power factor. The hydro billing analysis, which can also project the cost of penalties paid during the period covered, showed that annual penalties paid were approximately $8,300 for billed demand. This represented 21 per cent of the annual charges for demand.

To avoid paying these penalties would require correcting the power factor in the facility so that it was maintained at a level of 90 per cent or higher and thus having the demand rates being applied to the lower kW reading. This correction is most commonly achieved through the application of power factor correction capacitor banks in a facility in either a distributed or centrally located manner.

Based on the hydro billing analysis the amount of correction required for the facility to increase their power factor to above this 90 per cent threshold was determined to be a minimum amount of 223kVAR.

Demand loads ranged from 270kW to 360kW through-out the year. A 250kVAR auto-switching power factor correction bank was placed at the main electrical panel. This bank would switch power factor correction "on" and "off" in 50kVAR incremental steps as required. This would ensure that the system received only the correction it needed, when it needed it. The switching "on" and "off" of these steps is managed by an onboard micro-processor controller in the power factor correction bank which actively monitors the electrical systems power factor.

Once the bank had been in operation for several months, analysis was again conducted on the hydro bills to confirm the correction through the increased power factor and to determine the amount of actual savings.

The hydro bills confirmed that the correction bank was doing its job. For the three months reviewed after the correction had been installed the correction showed the power factor to be 94, 91 and 94 per cent.

Calculations were made to determine the amount of savings realized due to the installation of the correction bank. The method used to do this was to compare the actual amount paid against what would have been paid if the correction bank was not in place.

For the three-month period reviewed the monthly savings due to the power factor correction being installed were calculated to be: March - $990.49, April - $1,172.74, May - $990.49, for a total of $3,153.72.

The results of this undertaking demonstrate the value of the investment:

- Power Factor maintained at 90 per cent-plus as projected.
- Demand billing penalties were eliminated.
- Cost of correction: $14,995; annualized cost savings: $12,614.84.
- Payback: 14.2 months.

An additional benefit of the installation of the power factor correction bank is that it will free up approximately 25-30 per cent of the current kVA load on the transformer thus allowing for additional equipment to be added to the system.

Winston (Kip) Scoville manages promotion and sales at Cos Phi, an OACETT strategic partner located in Hensall, Ontario.

[1] Power Factor = kW / kVA