

**Informational Document from
Harmonics Limited IDHL-18**



Subject: Broadcast Studio SystemMax Installation

A major network central studio was powered by two parallel 500 kVA UPSs with a third as a redundant backup. Although the two transformers were loaded to only 45% of their rated capacity, the enclosures were too hot to touch.. Neutral currents were quite high and the bus ducts system was so hot that portable air conditioners were blowing a constant stream of air on the ducts. The studio management wanted to add more equipment but was afraid to increase any load because of fear of overheating and system failure. Various options for increasing capacity were being considered. Only the SystemMax HSS offered a way of powering more loads without buying bigger UPSs and re-wiring with larger bus duct. The HSS also offered ease of installation with no need for the extensive downtime that re-wiring would have entailed..

Three 500 kVA SystemMax units were installed, one on each UPS. The effects of this installation are shown in Table 1. The two 500 kVA UPSs have a combined current rating of 2,780 amps rms per phase. Without the HSS installed the combined rms phase currents were 1,267 amps. It is interesting to note that although the transformer was only 44% loaded, the enclosure was too hot to touch. The neutral bus was 62% loaded and, as already mentioned, was being continuously cooled to forestall failure.

After the SystemMax units were installed, the combined phase current was reduced to 1,187 amps, about 6%, leading to a new a loading of 41%...a slight reduction. The reduction in neutral current, which was mostly 3rd harmonic, was much more dramatic. The combined neutral current was reduced from 1722 amps to only 36 amps. This is a reduction of 98%. The neutral bus went from 62% loaded to only 2% loaded.

Without HSS		With HSS	
Phase current	(in amps)	Phase current	(in amps)
60 Hz	1129	60 Hz	1129
180 Hz	574	180 Hz	16
rms	1267	rms	1187
Neutral current	(in amps)	Neutral current	in amps
60 Hz	23	60 Hz	23
180 Hz	1721	180 Hz	28
rms	1722	rms	36

Table 1. Currents before and after installation of SystemMax Harmonic Suppression Systems. Values are the combined currents for two 500 kVA UPSs.

Because of the nature of the HSS, there was no system downtime during installation. The system was operated on two of the three UPSs while the other was retrofitted with the HSS. Physical results of adding harmonic suppression were immediately evident. Transformer enclosure temperature was reduced to slightly above room temperature. The portable air conditioners were no longer needed and were removed.

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When new studio equipment was installed, loading the transformers to about 50%, there was no noticeable increase in transformer enclosure or bus temperature. Using the Harmonics Limited Energy Savings Estimator, a 2½ year payback period for the entire cost of the installation was calculated. However, when the cost of renting and powering the portable air conditioning units was figured in, payback was almost immediate. The facility manager concluded that there was no other method of harmonic mitigation that he had examined that could possibly have produced the results noted with the small amount of effort required to complete the installation.

For further information contact:

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