



## Harmonic Cancellation Transformers

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Harmonic Cancellation Transformers not only perform their regular duty of providing voltage isolation and voltage step up or down, i.e.... 480 Volt Primary to 208Y120 Secondary, they also incorporate a phase shift that can cancel harmonics.

It has become well known that the presence of harmonics in your power system can and do cause overheating and failure of transformers, motors, lighting, switchgear, motor control centers, power correction capacitors, and solid-state equipment. The presence of harmonics can cause electrical, electronic, and computer equipment damage along with data corruption. Control system errors can develop due to electrical noise caused by harmonics. Harmonic currents can cause blown fuses for no APPARENT reason. Harmonic currents can also cause nuisance tripping of circuit breakers. In the present and recent past we have looked at over sizing our facility electrical equipment to handle these harmonics. Although this option can eliminate many problems associated with harmonics, over sizing alone does not eliminate harmonics.

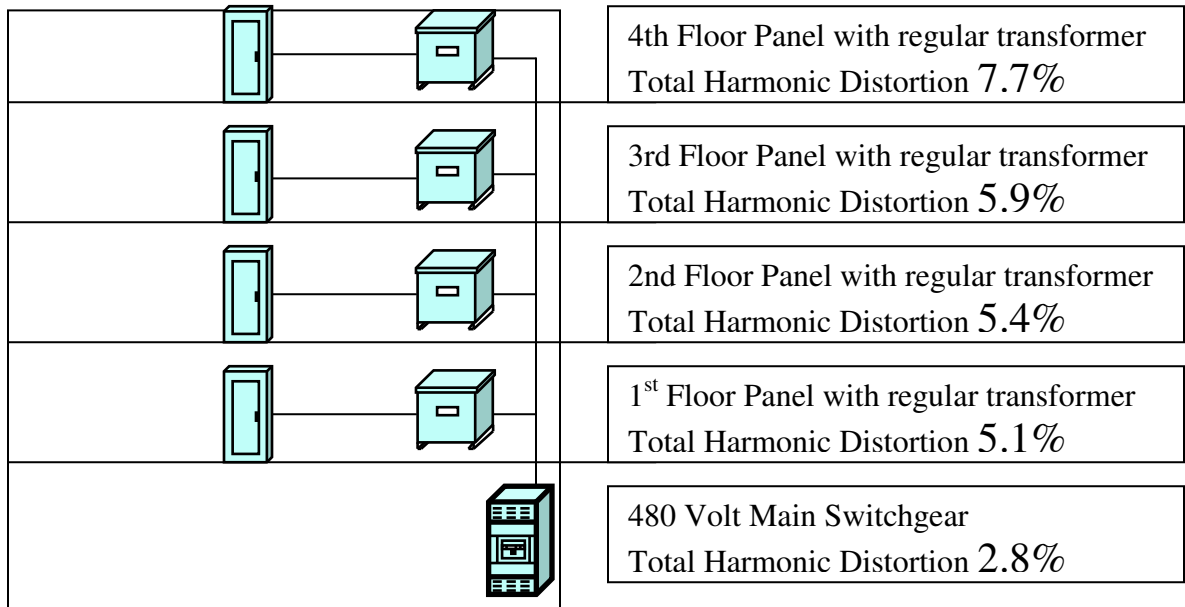
By not eliminating harmonics we can see other problems in our facility such as:

- High energy losses do to transformer and equipment overheating due to high harmonic currents.
- Sensitive electronics damage or malfunction due to voltage distortion caused by harmonics.
- Utility surcharges because of harmonics injected into the power grid by your facility.
- Unwanted downtime caused by any or all of the above.

Harmonic cancellation transformers help reduce harmonics in your power system. They differ from K rated transformers in that they treat and help reduce harmonics. K rated transformers only withstand harmonics they do little to eliminate them. The proper installation of Harmonic Cancellation Transformers can have a drastic effect on your power system. They can support up to two times more load than a traditional transformer when high harmonics are present. They can cost up to 50% less to operate due to the energy efficiency gained by reducing harmonics. They supply cleaner voltage than a K rated transformer reducing the risk of equipment damage. The following is an example of an

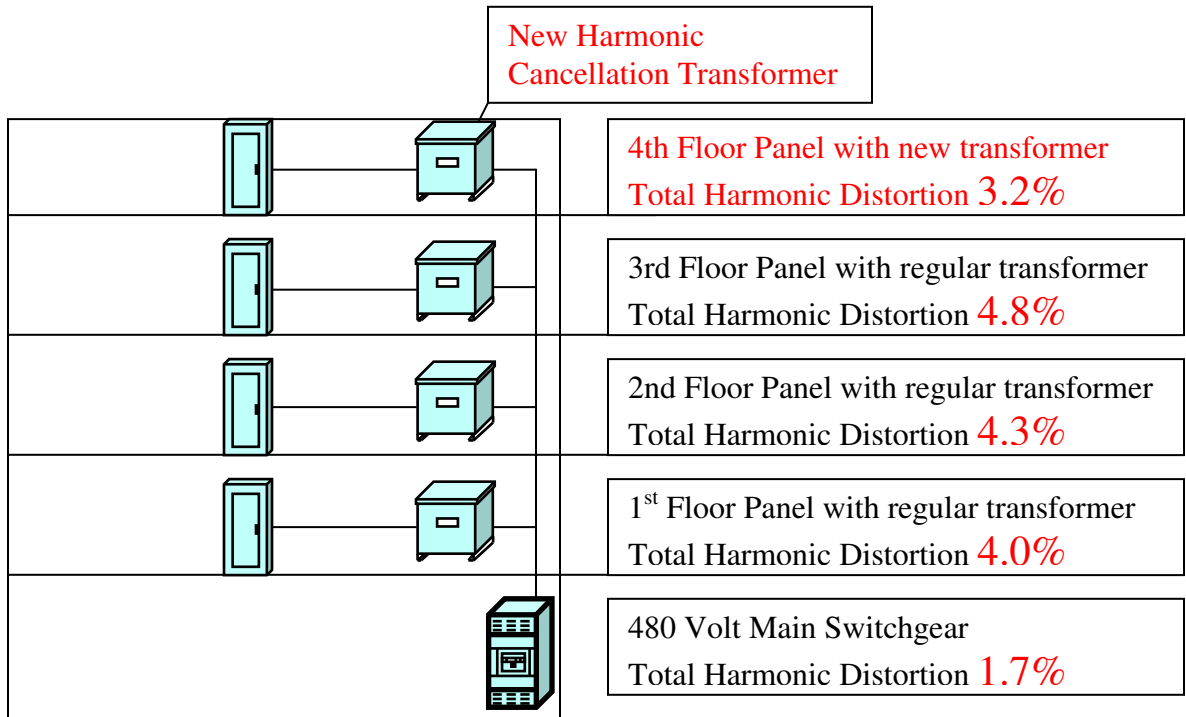


installation involving Harmonic Cancellation Transformers in a typical four-story office building:



**Original installation example with regular transformers**

Harmonic levels on each floor are above the IEEE 519 maximum allowed level of 3%. The 7.7% level on the fourth floor resulted in a distorted voltage waveform. Remember, installation of K rated transformers would not substantially change the harmonic levels, therefore, it was suggested that the building owner have a Harmonic Cancellation Transformer installed on the 4<sup>th</sup> floor only. After installation of only one Harmonic Cancellation Transformer on the 4<sup>th</sup> floor the following readings were logged:



Installation example with Harmonic Cancellation transformer on 4<sup>th</sup> floor.

Total Harmonic Distortion on the 4<sup>th</sup> floor dropped from 7.7% to an acceptable IEEE519 level of 3.2%. This also had an effect on the rest of the building power lowering the Harmonic levels as shown above. This case study was performed by Philip Ling P.E. at Powersmiths.

### In conclusion

The IEEE along with many telecommunications, aerospace, broadcast, hospital, educational, financial, and commercial/industrial companies are beginning to see the need to design and retrofit equipment to not only withstand harmonics but also treat and reduce them to help control the damaging effects of harmonics in their facilities.