SouthernLINC Wireless
A Southern Company

Ventilation Project Report

May 16, 2006

INTRODUCTION:

In June, 2003 a project was begun with a goal of reducing the power consumption of SouthernLINC Wireless cell sites. This project involved the installation of ventilation devices and ducts to re-direct the flow of heated air from the air conditioned portion of the cell site to a non-conditioned portion of the cell site or to the out of doors. This project was designed by Mike Lucy, Lead Engineering Analyst with SouthernLINC Wireless. Mike received technical assistance from Larry Lewis, Senior Market System Analyst and Engineer with Alabama Power Company. Active Ventilation Products of Newburgh, New York, supplier of the ventilation equipment, has also been involved in the design work and in the refinement of the project.

In the early stages of the project, power savings were immediately realized. The savings were small, on the order of nine percent. As the project was refined, the savings increased to seventeen percent and to as much as thirty-six percent. With the promising results from the tests the project was moved from the testing phase to the partial implementation phase. In all, twenty-seven cell sites have had the waste heat removal and re-use system installed.

VENTILATION SYSTEM DETAILS

The ventilation system consists of a set of shields that are installed around the equipment cabinets and duct work to carry the air flow from the back side of the equipment into the generator room or to the outdoors. Also included in the system is a passive vent that pulls excess heat from the generator room using any available outside air flow. The vent is a patented product from Active Ventilation Products, a partner in this project.

The system takes advantage of air flow created by the equipment fans in that they naturally exhaust heated air to the rear of the equipment. By confining this heated air into the space behind the equipment racks the air can be controlled and exhausted at a rate that allows proper cooling of the equipment while simultaneously removing heated air from the equipment room that would otherwise have to be cooled by an air conditioner. In cell sites where this system has been installed the air conditioners run very little on cold days while in typical cell sites the air conditioners run regularly, even on days when the outside temperature is below freezing.

There were some obstacles to overcome regarding the generator rooms. The generator rooms in the cell sites are full of air intake and air exhaust louvers and openings. When first started, it was thought that air would simply be pulled through the room. The Aura Vent actually caused a slight vacuum to be placed on the room, which caused cold air to be pulled in via the various other vents and openings that are necessary for the generator to function. The solution was to slightly pressurize the room with the exhausted air from the equipment room and allow the Aura Vent to remove only the overpressure air. This has proven to be an easy balance to maintain and the generator rooms remain above 55 degrees on cold days and below 100 degrees on hot summer days. The humidity stays below 50 percent in the generator rooms.

Prior to the installation of the ventilation system the generator rooms had to be heated and/or the generators had to have cooling system heaters running. The cost to heat these rooms amounts to the same as the additional cost to cool the cell site during the summer months. This being the case, any savings that would normally be realized from the cooler temperatures is offset by the cost of heating in the cold months.

The photos below are typical installations of the ventilation system.

Equipment Racks

Generator Room Duct Outlet

Duct To Generator Room

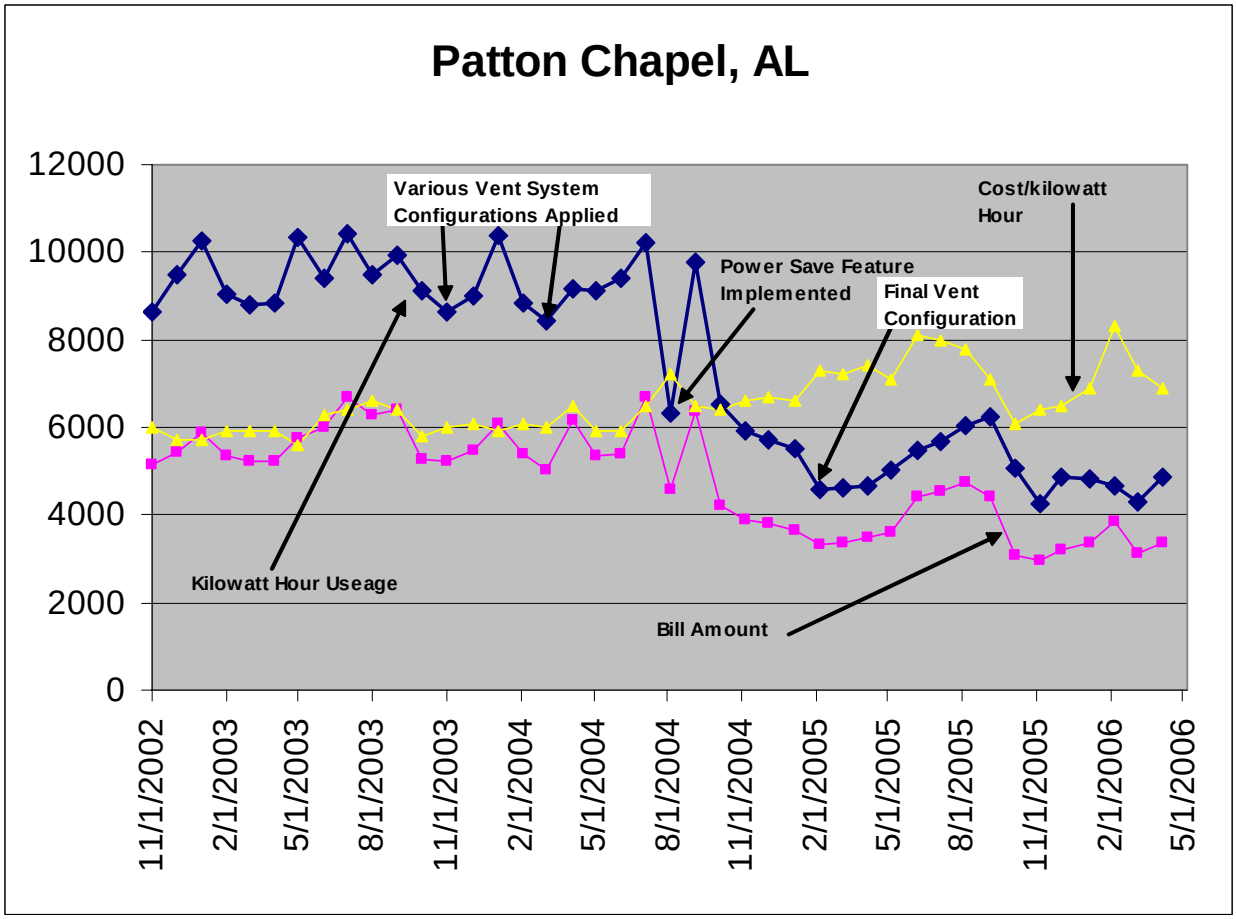
Aura Vent In Generator Room

As the project has progressed, certain adjustments have been made. It was determined that the intake air vents were too small to overcome air filter resistance and provide adequate air flow so an additional air inlet has been added to some sites and will soon be added to all sites and made a permanent feature. It was also found that the initial design of the exhaust into the generator rooms was not as efficient as it needed to be so changes have been incorporated into the duct fan design to improve these efficiencies.

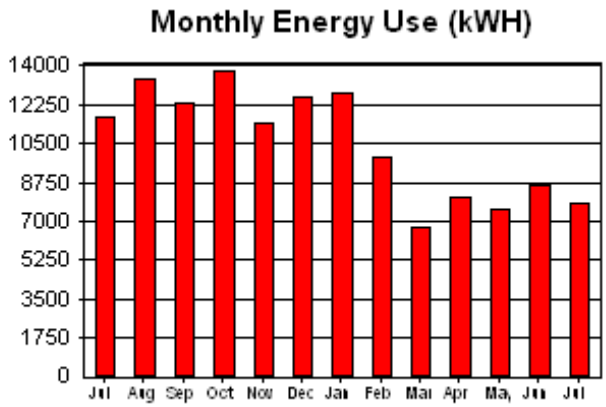
Performance Data

The performance of the ventilation system can only be quantified by the data. Using the Southern Company's power consumption figures was the vehicle chosen since the power bill data is from a reliable and consistent source. This data is collected monthly and has been used to track the project from the beginning. At various stages during the project daily and weekly power meter readings were made to check the results of various design changes.

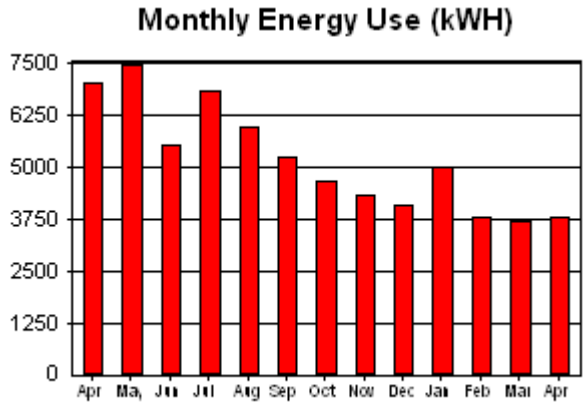
The chart below shows the power consumption, annotated, of the Patton Chapel, Alabama cell site. This was the first site to have the ventilation system installed and has been the test bed for changes. The chart not only shows the effect of the ventilation system but also, please note that a power saving feature was implemented to the cell site equipment in August of 2004. This feature is a software feature developed by Motorola that allows transmitters to stop transmitting at full power when cell site traffic is reduced. This feature had to be taken into account when calculating the true effects of the ventilation system as it did have an effect on the percentage numbers. With less heat generated, less heat has to be removed and thus the overall power savings numbers from the ventilation system were reduced as well.



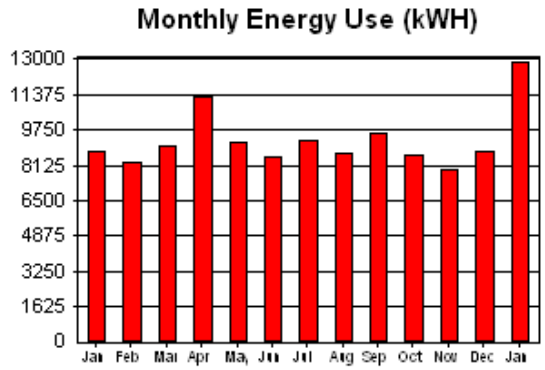
The chart below, from power company records, is indicative of the savings realized with the ventilation system. The July 2004 power consumption was 5710 kilowatt hours. The ventilation system was installed in February of 2005 and the resulting July 2005 power consumption was reduced to 3665 kilowatt hours. This reflects a 36 percent reduction in power consumption. The chart also reflects the continued reduction in power consumption.

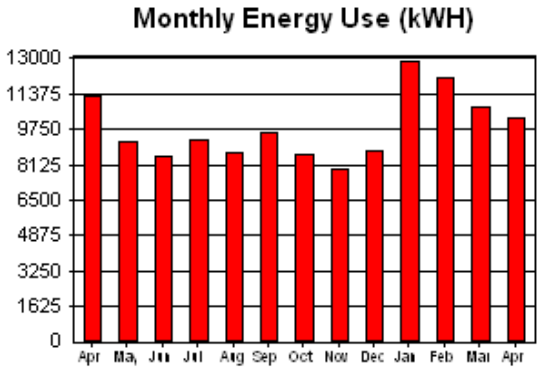


Not all cell sites have shown this level of power savings. In cell sites where the Motorola power savings feature has been implemented the savings are less. Typical savings in these cases is around 17 percent. The chart below is an illustration of this scenario. The increase in power consumption for January is attributed to disabling the power saving software feature for site maintenance.



The next chart indicates the effect of the ventilation system when site load is increased. In this instance five additional transmitters were added to the cell site in April. The ventilation system was also installed in April. The net effect was to null the impact of the additional transmitters. For this cell site the capacity of the site was nearly doubled without an increase in power consumption. The spike in January is due to the addition of four more transmitters and associated equipment. The ventilation system in this site has since been optimized and the power consumption reduced slightly as indicated in the chart to the right. Optimization resulted in an approximate 6 percent improvement in power savings after the second set of transmitters was added.





Conclusions

With energy costs rising and likely to continue to rise, saving energy means saving money. The extra benefit is also in saving energy, making us less dependent on fossil fuel energy sources. With segments such as the shipping industry trying to achieve even a one percent decrease in energy consumption, seventeen to thirty percent savings is a good range. The savings end up paying for the cost of the system, including installation costs, in less than two years for most cell sites and in less than one year for some sites. Other benefits such as reduced air conditioner run time and a better environment for the generators translate into reduced maintenance costs as well.

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