

## **Energy Reduction and its Impact to Existing Semiconductor Manufacturing Facilities.**

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Rising energy costs is a factor faced by all semiconductor manufacturing facilities. Facilities that are able to start up with or introduce energy efficient tools (vacuum pumps, solid state water chillers, tool air conditioning units and LCD flat screen monitors) will gain a competitive advantage. In our older factory we have begun a program to select high efficiency tools for our expansion and replacement of failed support equipment. Our expectation is that we will achieve:

- Lower power consumption through efficient design
- Lower power consumption through idle mode capability
- Greater capability through real time communication.
- Manufacturing technology improvement: tool throughput improvement

To support this change we have gathered data, both from vendors and from actual measurements in our factory, to compare and quantify the energy cost savings available with correct tool choices. We have focused on chillers, effluent scrubbers, process pumps, and photo tool air conditioning units. These were selected because they are either recent additions or exhibited issues with the current support tool.

It is generally believed that the energy savings gained from moving to a high efficiency support tool does not always cover the additional costs that may be incurred with its purchase. It has been demonstrated by others (Paul Westbrook, Texas Instruments Inc) that in a new facility, the small additions from each of the high efficiency tools can add up and even multiply such that great reductions in facilities support equipment can more than cover the costs of the high efficiency equipment. In an older factory changing the facilities support equipment is generally not an option. With this in mind, a tapered (expansion and failure) approach has been taken in our factory. Additionally we found in our exploration, especially with effluent scrubbers and heat exchangers, if the cost of unscheduled down time is factored in, the additional costs of high efficiency support equipment has very short payoff times. This is generally accomplished because high efficiency support equipment is simpler and is expected to run without failure for extended periods of time.

There are very valid reasons to move to high efficiency support equipment for older factories. Energy efficiency, reliability, and low payback periods in old factories all need to be considered.