It is no secret that the recent economic downturn has put building owners, property managers and even some tenants under extreme pressure to keep their facilities occupied and operational. And even though the commercial and industrial property market is beginning to recover, building occupancy and rents are still below 2008 levels. As a result, building operations and maintenance has been put on a shoestring budget.

A 2010 study by the Aberdeen Group on “Facility Management Strategies to Reduce Operating Costs” asked facility managers to rank their top two market pressures. The results were:

- Need to drive down operating costs 85%
- Need to maximize return on assets 23%
- Reduce risk related to adverse events 18%
- Need to delay capital expenditures 17%
- Impact of facilities on workplace productivity 13%
- Regulatory compliance 11%

Best-in-class performers in this study shared two important characteristics. They were more than twice as likely to link their facilities metrics to financial metrics and they were more than twice as likely to use energy consumption and costs for decision making. Fortunately, a new standard for building operations is emerging that can help facility managers combat these market pressures.
Three Core Ideas

At the foundation of this new approach are three core ideas that shift traditional thinking from one dimension to three. The advantage of this action is to expand thinking beyond short-term problems to a more holistic and cost effective solution for the long-term health of buildings and their occupants. Those ideas include:

- Focusing on building maintenance, repairs and operations. The traditional approach focuses primarily on maintenance and repairs.
- Employing a systems approach versus an equipment approach. The traditional approach focuses primarily on equipment, so how the equipment operates within a system is largely ignored.
- Deploying preventive, predictive and proactive maintenance strategies in an integrated fashion. The traditional approach focuses on preventive maintenance only.

In short, these core ideas are the building blocks of a new standard for building operations knows as 3 Dimensional Maintenance.

Focus on Building Maintenance, Repairs and Operations

Traditionally service providers focus on repair and maintenance costs which affect less than a quarter of all operating expenses for a typical building. By including repairs and maintenance, as well as utility costs, a multi-dimensional maintenance approach has the ability to affect 54 percent of the total operating costs of a building. According to a PECI estimate in 1999, O&M programs targeting energy efficiency can save 5 to 20 percent on energy bills without a significant capital investment.

In their 2010 Federal Energy Management Program, the U.S. Department of Energy found that "effective O & M is one of the most cost effective methods for ensuring reliability, safety and energy efficiency." And that "inadequate maintenance of energy-using systems is a major cause of energy waste in the private sector."
Systems vs. Equipment Focus

A simple shift in thinking from a maintenance focus directed toward equipment to proactive management of building systems can reduce operating costs by up to 30 percent over the life of the building without capital expenditures. What’s more, a building systems approach can also deliver important benefits and value that are not possible with a simple, preventive maintenance only contract. Value elements to this new approach include:

- Increasing equipment uptime
- Increasing reliability
- Creating a better working environment for employees
- Extending equipment life
- Providing resources for capital needs
- Increasing asset value and maximizing return on assets
- Significantly reducing a building’s energy, carbon footprint and operating costs

Combining Preventive, Predictive, Proactive Strategies

By deploying preventive, predictive and proactive strategies to building operations, property owners and facility managers now have a solution for extending the life of building systems while managing operational and capital costs and improving reliability in a more rational manner. Here’s how it works.

PREVENTIVE MAINTENANCE

This element is time based and assumes regular testing and inspection using a predetermined schedule. It is intended to ensure the life of existing equipment and improve the comfort and working conditions of your most valuable assets, your employees or tenants. It includes among other services:

- Testing and inspections
- Equipment operating measurements
- Consumable replacements
- Cleaning
- Record keeping for tracking, failures and equipment utilization
- Minor adjustments to components
- Log reports
PREDICTIVE MAINTENANCE

This element is condition based and is used to detect early warning signs of equipment or component failure once damage has already occurred. This process is intended to improve reliability and also reduce some preventive maintenance tasking. It includes among other services:

- Bearing condition analysis
- Laser alignment
- Infrared thermography (heat detection)
- Ultrasonic detection (sound)
- Tribology (oil analysis)
- Air quality testing
- Dynamic and static motor circuit analysis
- Vibration analysis
- Combustion analysis

PROACTIVE MAINTENANCE

This element goes well beyond standard preventive and predictive maintenance. It not only assures that facilities will be more comfortable and reliable, but most importantly, it assures that buildings will be less costly to operate. A proactive strategy focuses on systems instead of the typical equipment-based approach to both operating and maintaining a building. It includes among other services:

- Benchmarking facilities against similar types of buildings across the country.
- Analyzing each piece of equipment for the optimum types of maintenance and rating each piece of equipment for (1) Criticality, (2) Duty Cycle and (3) Operating Conditions.
- Performing an operational assessment of the building focusing on efficient utility usage. Using high tech devices to measure energy, gas and water consumption, as well as carbon dioxide air quality and lighting, a service systems engineer can find problems to be addressed as part of an overall building optimization plan.
- Creating an optimization plan to tune up the facility. A property owner/manager can choose an optimization plan that meets their budget and performance criteria.
- Creating a capitalization plan to control future requirements. Money realized as savings in the building optimization process can be re-budgeted for future capital requirements.
What does all of this mean? How much does it cost? While at first glance (see chart below), you might think that spending a bit more on maintenance might actually increase your operating expenses, however, studies clearly show 3 Dimensional Maintenance is the lowest cost way to operate a building.

The U.S. Department of Energy found that by focusing on efficient operations and maintenance practices, their calculated savings range from 3 to 40 percent with an average of 15 percent. Furthermore, they found that effective O&M measures cost 20 times less and achieve roughly the same savings as retrofitting equipment to achieve similar results. The methods used to achieve these savings were a mix of preventive, predictive and proactive maintenance.

By employing a preventive, predictive and proactive approach to facilities maintenance it is possible to reduce the total costs of building operations by as much as 3 percent per year. In fact, a 3 Dimensional Maintenance strategy can achieve between 2 to 7 times more return on investment on the marginal increase in annual maintenance costs. Those cost savings can then be used to free up budget for capital expenditures as older equipment finally reaches the end of its functional life to increase the value of your building or to improve your net operating income. The chart below outlines annual 3 Dimensional Maintenance savings as opposed to a basic maintenance approach.

<table>
<thead>
<tr>
<th>EXPENSE</th>
<th>PREVENTIVE</th>
<th>3 DIMENSIONAL</th>
<th>3 DIMENSIONAL COST/SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>77,000</td>
<td>84,000</td>
<td>7,000</td>
</tr>
<tr>
<td>Repairs</td>
<td>143,000</td>
<td>128,000</td>
<td>(15,000)</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td>250,000</td>
<td>243,000</td>
<td>(7,000)</td>
</tr>
<tr>
<td>Janitorial/Grounds/Security</td>
<td>225,000</td>
<td>225,000</td>
<td>0</td>
</tr>
<tr>
<td>Administration</td>
<td>135,000</td>
<td>133,000</td>
<td>(2,000)</td>
</tr>
<tr>
<td>Utilities</td>
<td>229,000</td>
<td>206,000</td>
<td>(23,000)</td>
</tr>
<tr>
<td>Leasing/Vacancy</td>
<td>388,000</td>
<td>380,000</td>
<td>(8,000)</td>
</tr>
<tr>
<td>Total Cost of Operations</td>
<td>1,447,000</td>
<td>1,399,000</td>
<td>(48,000)</td>
</tr>
<tr>
<td>Return on Investment</td>
<td></td>
<td></td>
<td>6.85 to 1</td>
</tr>
</tbody>
</table>

*Based on a typical 100,000 sq. ft. class A commercial office building
3 Dimensional Maintenance can also provide building owners with added benefits of increasing Net Operating Income and overall Building Asset Value by providing energy savings in the range of 5 to 30 percent. Recent Building Owner and Managers Association (BOMA) data shows that for every $1 per square foot spent on energy performance improvements increases in building asset value are possible (see table to the right).

Additionally, Net Operating Income is also affected positively from energy savings that can be realized by employing a 3 Dimensional Maintenance strategy. The graph to the right shows NOI increases of up to 4.85 percent with the achievement of a 30 percent energy savings level.

### POTENTIAL ASSET VALUE INCREASES

<table>
<thead>
<tr>
<th>ENERGY SAVINGS</th>
<th>COST SAVINGS/SQ. FT.</th>
<th>ASSET VALUE INCREASE/SQ. FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>$0.20</td>
<td>$2.50</td>
</tr>
<tr>
<td>20%</td>
<td>$0.40</td>
<td>$5.00</td>
</tr>
<tr>
<td>30%</td>
<td>$0.60</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

*Energy Costs = $2/sq. ft. Capitalization Rate = 8%  
*BOMA Energy Efficiency Program Presentation 2011

### POTENTIAL NOI INCREASE FROM ENERGY SAVINGS

- **0.8%** at 10% energy savings
- **1.6%** at 20% energy savings
- **2.4%** at 30% energy savings
- **3.2%** at 40% energy savings
- **4.0%** at 50% energy savings
- **4.85%** at 60% energy savings
In summary, 3 Dimensional Maintenance sets a new standard in building maintenance because it:

- Focuses on maintenance, repairs and operations
- Employs a systems approach versus an equipment approach
- Deploys preventive, predictive and proactive maintenance strategies

This unique strategy can provide property owners the best return on investment of any maintenance approach available. It can increase net income and asset value while simultaneously extending equipment life, improving reliability and reducing operational costs. In addition, it addresses the most critical market pressures that facility managers across the country are faced with at a time when market pressures appear to be peaking.

The maintenance methods used in 3 Dimensional Maintenance have been studied by the U.S. Department of Energy and have become part of their Federal Energy Management Program as THE model for operating and maintaining federal buildings with the goal of reducing energy intensity by 30 percent and water consumption by 16 percent across the country.

In the end it not only will save building owners and occupants money by reducing operating costs, but it is changing the way buildings will be operated and maintained in the future.