Johnson & Johnson Strives to Implement Best Practices by Year 2000

Harry A. Kauffman, Johnson & Johnson

ABSTRACT

Johnson & Johnson is the world's most comprehensive broadly-based manufacturer of health care products. Utilizing a decentralized management philosophy, the 188 operating companies around the world operate independently.

Although Johnson & Johnson is not an energy intensive company, we have had a coordinated energy program since 1972. In the 1990s, however, a renewed focus, prompted by the link between energy usage and pollution, led to some very aggressive energy reduction goals to be completed by the end of the year 2000.

To assist the operating companies in meeting these goals, a comprehensive set of Best Practices was developed. They cover all facility energy-using equipment and maintenance practices. Inputs included projects completed at Johnson & Johnson facilities worldwide, best practices from several US government voluntary programs, and recommendations from consultants and engineering firms. The end product is now being used worldwide to benchmark our progress.

To ensure that these Best Practices are incorporated into new construction as well as our existing facilities, we developed our "New Facility Design Criteria" which is in the format that architectural/engineering firms can easily utilize.

We originally validated the Best Practices in two retrofit pilots and two new buildings. They all achieved significant energy savings. As of April 1999, we have completed 62% of the Best Practices at our 96 facilities in the US and Puerto Rico. Twenty-four of these facilities had achieved an 80% completion level in 1998 and were recognized with our internal recognition plaque.

Through full implementation of these Best Practices, we at Johnson & Johnson feel confident that we will be able to meet our Year 2000 energy reduction goals.

INTRODUCTION

Who is Johnson & Johnson? We are the world's most comprehensive, broadly-based manufacturer of health care products. We have 93,900 employees at 188 operating companies, with sales in 175 countries around the world. We provide products directly for the consumer such as BAND-AIDS™, TYLENOL™, and NEUTROGENA™. We have a significant pharmaceutical operation and also provide products to hospitals.

Johnson & Johnson has had a coordinated energy program since 1972. The program initially included a corporate staff (2 people - a professional and a secretary), a consolidated energy reporting system, energy teams representing the various independent operating companies, and a set of general recommendations. In 1972, the program covered only the US but was expanded over the years to include all regions of the world. It was founded based on a concern for reliability of supply as well as the rapidly rising energy costs associated with the energy crisis in the early 70s.

Unlike some other corporate energy programs, however, we have been fortunate to continue and expand ours beyond 1972. The emphasis did, however, rise and fall based on energy related conditions. While there was a low priority in the 80s, the emphasis has been renewed in the 1990s fueled by the link between the environment and energy usage. The priority is now high and continues to increase.

We are not an energy intensive company. We occupy 41 million sq.ft. of space around the world: manufacturing, research, warehouses, and offices. We use only 36.00 KHW/sq.ft. and 1.20 Therms of fuel/sq.ft. worldwide. This equates to 0.24 MMBTU's/sq.ft. Only 0.44% of our sales is spent on energy while close to 10% is spent on research.

While the sale of health care products is our core business, the 188 companies operate very independently making a coordinated energy program a challenge.

METHODOLOGY

In spite of this decentralization and this challenge, we have a common bond that unites our businesses around the world: Our Credo. Our four responsibilities are:

- Our Customers who use our products,
- Our Employees,
- The Communities in which we live and work,
- The Stockholders.

Defining our responsibility to the Communities, Our Credo says: "We must protect the environment and our natural resources." When the link was made by Johnson & Johnson between the environment and energy usage, this community responsibility enabled us to escalate our energy efforts around the world.

First, we enrolled in the Environmental Protection Agency's Green Lights in 1991 and shortly thereafter established a worldwide energy reduction goal as part of our pollution prevention goals. In addition to energy reduction, the Pollution Prevention Goals included: packaging component reductions, paper waste reduction and recycling, hazardous waste reduction, CFC phaseout, and general waste reduction. An initial goal of a 10% indexed energy reduction in the time frame 1991-1996 was expanded when we achieved this goal early. The present goal is a 25% energy reduction for each facility in most regions of the world (15% for Asia/Pacific and Europe) by the Year 2000 with a base year of 1991, indexed to production, weather and area of our facilities. We are also striving to reduce our actual energy usage by the Year 2000 back to the 1990 levels to support the Rio Earth Summit Treaty. This final goal will be very difficult to achieve since we have already doubled in size in 1997 compared to 1990.

Since our energy program had been in place since the 1970s, we had numerous energy efficiency recommendations in many different formats. We had some in an

Energy Manual, we had some in a Construction Manual, we had EPA's Green Lights recommendations, and finally when we joined EPA's Energy Star Buildings, we developed an Energy Star Buildings Manual to include their recommendations. Some of the recommendations were the same, but each manual also had unique recommendations depending on the focus of the manual. In addition, they were not current and did not include many practices that were in place at the Johnson & Johnson facilities.

It became very apparent that we needed a consolidated, comprehensive, but flexible, set of Best Practices. We felt that the Energy Star Buildings model was a perfect, easy-to-understand model and as a result, it served as the model for our Best Practices. However, the Energy Star Buildings program is geared towards commercial and retail spaces only. We had also become a partner in the Department of Energy's Motor Challenge and EPA's Climate Wise so we rolled all of these recommendations into our Best Practices. (Energy Star Buildings, Motor Challenge and Climate Wise are all voluntary programs as part of the US government's Climate Change Action Plan. They are coordinated by either the US Environmental Protection Agency or the Department of Energy.) With these as our base case, we formed task forces from our Technical Advisory Council to evaluate, by stage, the recommendations. We sorted our worldwide database of completed energy projects by stages and added any cost-effective projects to the Best Practices. Draft copies of our Best Practices were then forwarded to the EPA, consultants, and engineering firms, as well as to key Johnson & Johnson engineers in all regions of the world for comments.

Finally, in 1995, after a year and a half of development, we rolled out our Best Practices. There are 150 in all and every one of them has been completed by at least one of our facilities around the world. While they are state of the art technologies and practices, they are not undeveloped technologies with extremely high paybacks. We use as a cost effectiveness test an internal rate of return of 20%, which is about a 5 year simple payback. While our facilities are not forced to implement these Best Practices, for them to receive credit, they need to implement all that pass the cost effectiveness test and are actually encouraged to go beyond these. In addition, we have an on-going review process and if new technologies are developed and prove to be cost effective, we add them to the Best Practices.

Examples of the Best Practices include:

Stage 1:	Upgrade lighting with T-8 or T-5 fluorescents, occupancy sensors, metal halide or high pressure sodium, Light Emitting Diode (LED) exit signs and implement group relamping.
Stage 2:	Perform preventive maintenance and calibrations, challenge and fine tune operating schedules, survey leaks including steam traps and compressed air, track, graph, analyze, and publicize energy usage and cost, develop pie chart of functional usages of energy, and optimize energy purchasing.
Stage 3:	Upgrade office equipment. Upgrade building envelope with double- paned windows, and appropriate insulation, seal any openings, and complete a thermographic scan of the entire building.
Stages 4 & 4+:	Evaluate all motor systems throughout the facilities and upgrade including technologies such as premium efficient motors (we have

our own standard that exceeds requirements of the Energy Policy Act of 1992 for energy efficient motors), variable speed drives, and Direct Digital Control.

Stage 5: Upgrade Chillers, Boilers, Compressed Air and Electrical Distribution to include: non-CFC, central-chiller water system with 0.56 KW/Ton water-cooled chillers with variable speed drives, primary/secondary chilled water pumping system, low excess air burner for the boiler with stack economizer and blow-down heat recovery, automated compressed air systems with proper storage, looped piping system, and minimum pressures, and k rated energy efficient transformers with capacitors for power factor correction.

RESULTS

To validate the Best Practices, we had two facilities volunteer as pilots. Our Ethicon Endo-Surgery manufacturing facility in Albuquerque, NM completed all 150 of the Best Practices by 1997 and reduced their overall energy usage by 23% and energy costs by $156,403. They were recognized for this effort by "Energy User News" magazine with an Efficient Building Award in 1998 in the Industrial category, as well as by the EPA as its Outstanding Building Upgrade for 1998.

The other pilot was a multi-company (two companies), multi-facility (four buildings -- one administration and three manufacturing) operation in Manati, PR. They have completed 97% of the Best Practices (inability to shutdown equipment has delayed some motor upgrades) and reduced their overall energy by 28% and energy costs by $604,630. In addition to the typical upgrades, they consolidated their individual steam, chilled water and compressed air systems. They shared the EPA's Outstanding Building Upgrade with the Albuquerque facility.

What are our results? We are monitoring the progress of 96 facilities in the United States and Puerto Rico. As of April 1999, we had implemented 62% of our Best Practices (Figure 1).

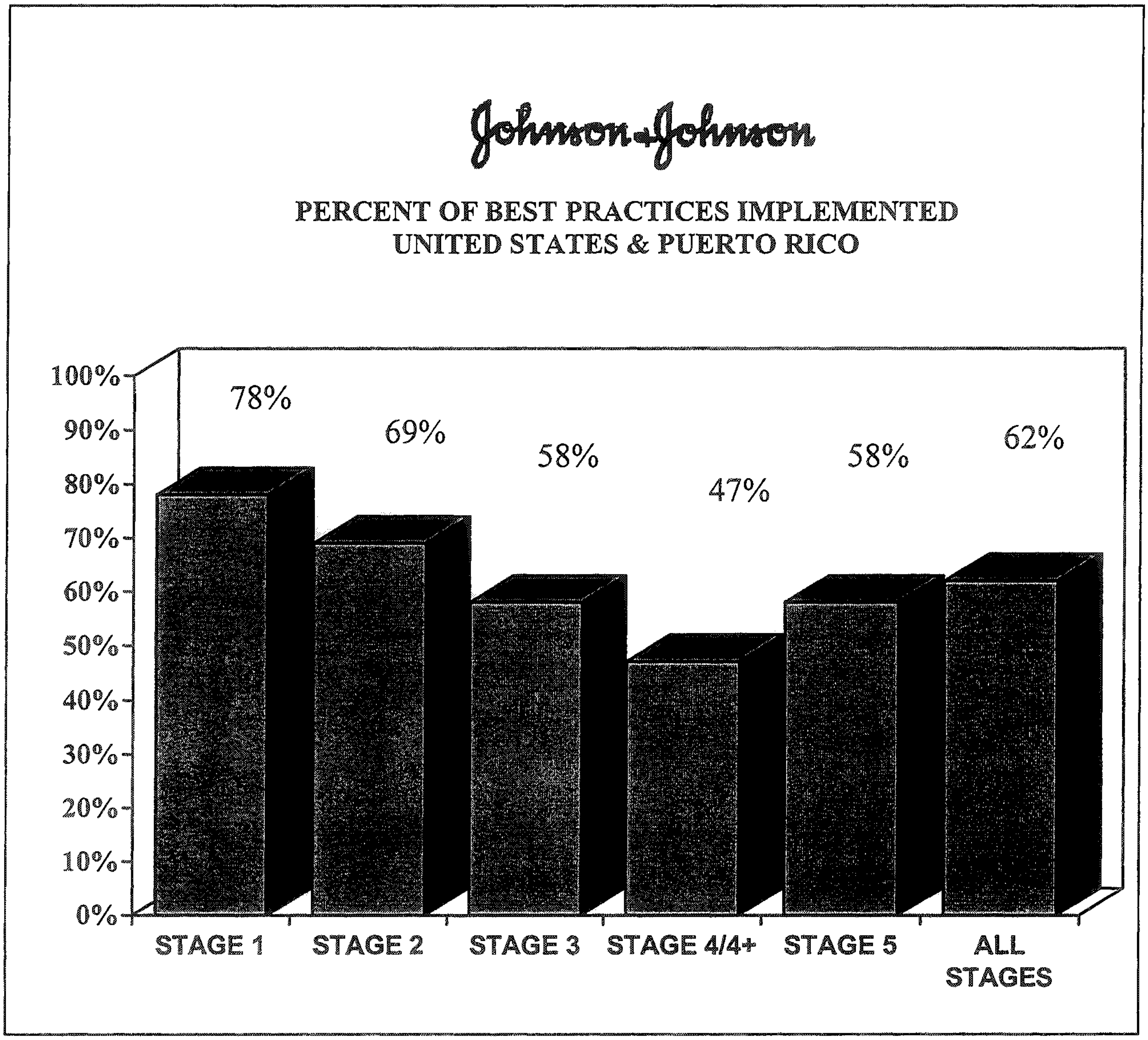

FIGURE 1. Best Practices completed by the 96 Johnson & Johnson facilities in the United States and Puerto Rico as of April 1999

As a result, we have saved $6,902,412, which is 95% of our savings goal. The savings goal was based upon 10% of our cost in 1994 for our United States facilities and 20% of our cost in 1994 for our Puerto Rico facilities (Figures 2).

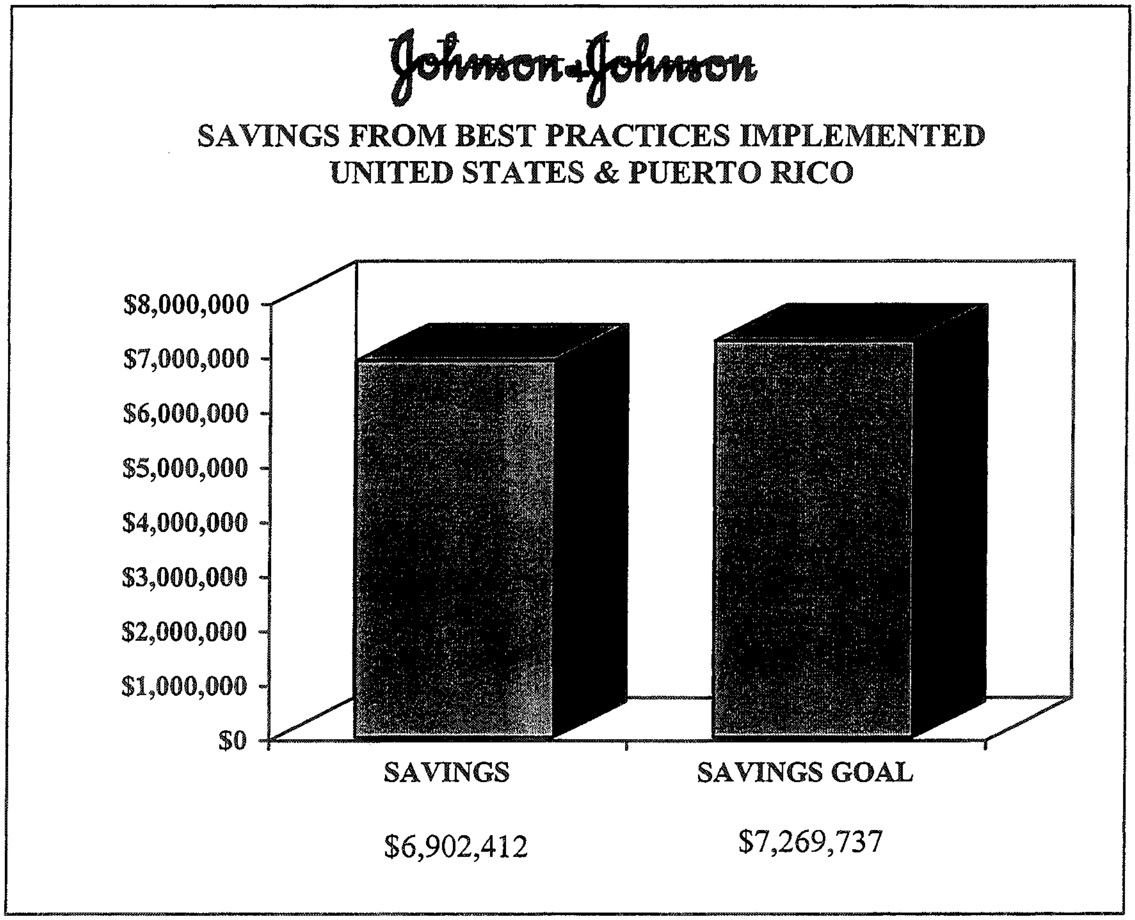

FIGURE 2. Savings from the implementation of Best Practices at the 96 Johnson & Johnson facilities in the United States and Puerto Rico as of April 1999.
NOTE: Lighting projects completed prior to 1996 are not included in this graph; they were part of a separate, earlier initiative that resulted in an additional $3.55 million savings.

The cost, savings and paybacks vary by grouping of Best Practices. The average simple paybacks for completed project by Stage have been: Stage 1 - 2.15 years, Stage 2 - 2.48 years, Stage 3 - 3.46 years, Stages 4/4+ - 2.79 years, Stage 5 - 10.15 years. The high payback for Stage 5 is due primarily to our CFC phaseout policy which required the replacement of numerous chillers. While significant energy savings were achieved, the projects were not necessarily justified on energy savings alone. The payback for Stage 2, Building Tune-Up, was also higher than expected since several energy management systems were upgraded to comply with the best practices to optimize operating schedules. A summary of the cost and savings is shown in Figure 3.

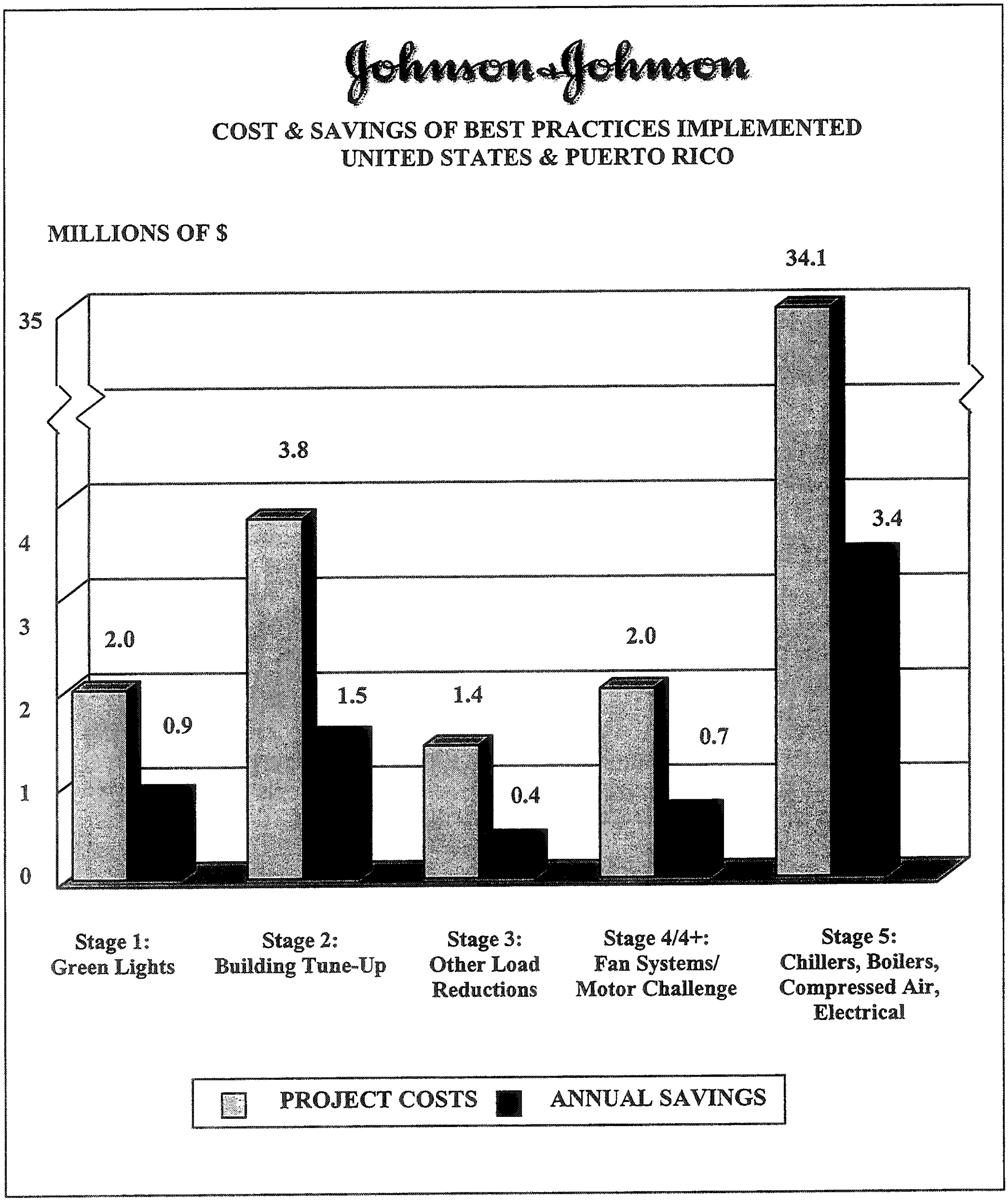

FIGURE 3. Summary of Cost and Savings for Best Practices implemented during 1995-April 1999

In addition to the comprehensive pilot projects mentioned earlier, following are some very specific projects by stage and best practice.

A comprehensive lighting upgrade was completed at a 1.1 million sq.ft. manufacturing, research and corporate headquarters facility in New Jersey. Technologies included: T-8's with electronic ballasts, low wattage metal halide, mercury vapor to high pressure sodium in the parking lots, occupancy sensors in offices, rest rooms, conference rooms and open areas, programmable digital timers in mechanical rooms and LED exit signs. This project, completed over several years in the early 1990's prior to formal rollout of the Best Practices, reduced their lighting costs by 69% and realized savings of $320,000/year. At a total cost of $1 million, the simple payback was 3.1 years. Rebates from the local utility company reduced this payback further.

Two Stage 2 Building Tune-Up best practices include compressed air leak and steam trap surveys and repairs. At one of our pharmaceutical plants in Puerto Rico, the steam traps were surveyed and repaired at a cost of $5,020 with a savings of $24,660 for a simple payback of 0.2 years. The compressed air system was also surveyed for leaks. The survey and leak repair costs were $10,000 but realized savings of $38,518 for a simple payback of 0.24 years.

An example of a cost effective Stage 3, Load Reduction, project was to install window film at another manufacturing facility in Puerto Rico. The savings for this project were $11,125/year. At an installed cost of $16,000, the simple payback was 1.44 years.

Typical Stage 4/4+ projects include the installation of energy efficient motors and variable speed drives. At a research facility in Skillman, NJ, two supply air handling units and exhaust fans were upgraded with new energy efficient motors and variable speed drives at a cost of $101,600 for an annual savings of $50,900 and a simple payback of 2 years.

Stage 5 covers projects in the central utility plant. An upgrade of the compressed air system at a manufacturing facility in Puerto Rico included: pressure control, improved connections, elimination of inefficient air using equipment, automatic control of air using equipment, dryer replacement, condensate drain control and additional storage. The project cost $43,700 for a savings of $27,500 and a simple payback of 1.6 years. A plate and frame heat exchanger was installed in the chilled water system in Albuquerque, NM to take advantage of the cool nights and winter months to utilize tower water cooling during these time periods. At a cost of $60,000, annual savings of $19,278 were achieved for a simple payback of 3.11 years.

An example of a chiller upgrade that was actually not cost effective was completed at a research facility in Skillman, NJ. Two 370T chillers using CFC11 refrigerant were replaced with (2) 400T chillers using HCFC123 refrigerant, one of which had a variable speed drive for part load operation. The project cost over $400,000 with annual savings of $21,420 for a simple payback of over 20 years. However, CFC's were eliminated and state of the art equipment was installed.

If we assume a national average of 1.5 lbs. of CO_2/KWH for electricity and 117 lbs. of CO_2/MM BTU for fuel, these projects have reduced our annual CO_2 emissions by 14.4 million pounds of CO_2. These savings are both indirect due to electricity reductions that result in emissions reductions at the power plants and direct due to fuel reductions at our facilities.

Of the 96 facilities, 24 have actually completed over 80% of the Best Practices with 100% of Stages 1, 2 and 3 complete. These best-in-class facilities contributed $4.4 million to our total savings. This was the benchmark for 1998 to receive our Best Practices plaque. The plaque is a great motivator with many facilities establishing a goal to obtain the plaque in 1999. (They need to be 90% overall and 100% of Stages 1, 2, 3, and 4/4+ in 1999). Another motivator is that the Best Practices serve as the performance-based alternative to receive credit against the energy reduction goal. Since we don't index everything, such as to sales, growth within the same space, research expansion, additional requirements, etc., some facilities cannot achieve the percent reduction. By implementing the Best Practices, they receive the same credit. After all, our ultimate goal is to complete 100% of the Best Practices at 100% of our facilities.

Reporting is a problem. To relieve this concern somewhat, we've developed an Excel spreadsheet that is customized for each of the 96 sites. It automatically generates graphs to show their results and is used as an on-line tool for monitoring their results. Periodically it is sent electronically to the Corporate Energy Group to upgrade the master database.

In our effort to motivate facilities managers to implement the Best Practices, we have also highlighted the other benefits. With newer technologies, there is generally less maintenance required and more up time achieved. Comfort conditions can be improved while using less energy. This results in fewer complaints to maintenance. While we haven't tracked productivity improvements quantitatively, several employee surveys have indicated employee productivity has increased as a result of improved lighting and better comfort conditions.

These motivators have caused steady progress as is shown in Figure 4.

PERCENT COMPLETION OF BEST PRACTICES
UNITED STATES & PUERTO RICO

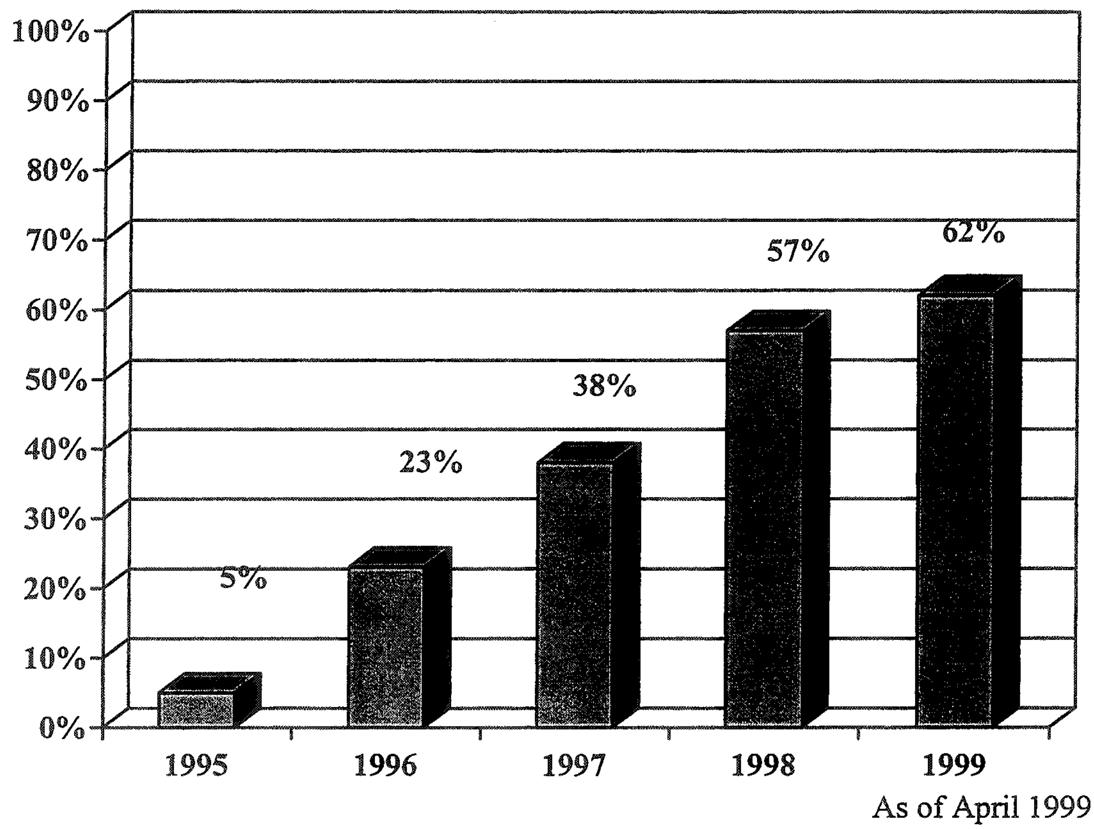

FIGURE 4. Johnson & Johnson's progress made against Best Practices: 1995 - April 1999

While it is very productive to retrofit our existing buildings, it is much more cost effective to include the Best Practices in new construction. Once again we ran into a barrier with architectural/engineering (A/E) firms. They found it difficult to incorporate our five-stage model into their design process. As a result, we transferred the appropriate Best Practices (we left out the maintenance portions) into our New Facility Design Criteria which is in the format that the A/E firms can use. We are attempting to institutionalize life cycle costing in design decisions and have been very successful. We have built at least five facilities in the last couple of years that are 100% compliant with these new construction Best Practices.

While we are presently only formally monitoring the progress of our US/PR facilities, we have rolled out the Best Practices worldwide. In 1998, we customized the Excel format for all facilities worldwide that were lagging in their energy reduction goal. In 1999, we provided the customized Excel format to every International facility.

Beginning in 1997, implementation of the Best Practices was the number one criteria for our top energy recognition awards worldwide, Excellence in Energy Efficiency. As a result, several international companies have submitted their progress.

CONCLUSIONS

While the Best Practices concept may seem very basic, it is very difficult in a large, multi-national, decentralized company to actually coordinate any activity. Our Best Practices provide a common tool around the world to measure an individual facility and to benchmark against other Johnson & Johnson facilities. By consolidating these Best Practices into a user-friendly package and highlighting all of the benefits beyond energy efficiency improvements, we are successfully overcoming the barrier of a decentralized operation. It is our belief that our Best Practices can be applied to a multi-site company or a single facility. From an energy standpoint, we are all speaking the same language. The Best Practices have become a very powerful tool. We feel confident that this tool will enable us to meet our energy reduction goals and exceed our energy cost reduction goal.