



## AMCOR ACHIEVES IMPRESSIVE RESULTS

*..... fifteen energy saving opportunities were identified with the potential to realise savings in excess of \$1.65 million per year.*

### **AMCOR BIG ENERGY PROJECT - saving costs, reducing energy, improving operations**

Impressive results have emerged from a Big Energy Project (BEP) innovation workshop at Amcor Botany Mill in Sydney. Projected energy cost savings of approximately \$1.65 million and greenhouse gas emission reduction of more than 20 000 tonnes have shown that implementing energy efficiency best practice measures can lead to significant wins. Remarkably, these savings were achieved in only one section of the plant by concentrating on improvements to the boiler plant and steam distribution system alone.

Located in the heart of the industrial precinct at Botany, the paper mill produces 250 000 tonnes of fibre packaging per year for the manufacture of corrugated cardboard. With energy costs in the order of \$14.4 million in 2002 and greenhouse emissions equating to over 300 000 tonnes, Amcor was invited to participate in a pilot program designed to redefine best practice in energy management by identifying opportunities through big step innovation.

The success of the project was based on the committed engagement of Amcor staff in combination with a team of consultants using an innovative and collaborative approach to energy management. Outcomes included both technical improvements and, importantly, a change towards a conservation culture. The project also achieved a long-term strategic vision for energy management.

This case study provides an overview of the Amcor Botany project, highlighting major achievements to date and long-term benefits to the site.

## SETTING THE SCENE

The paper industry is a large consumer of energy. Total annual energy consumption for the industry sector is approximately 47.6 petajoules (PJ), of which electricity accounts for 21 percent of total consumption and gas for approximately 40 per cent. In 2000-2001, members of the Australian Paper Industry Council (APIC) spent over \$200 million on energy.

The Australian Government Department of Industry, Tourism and Resources (ITR), through the former Energy Efficiency Best Practice Program, approached Amcor to participate in an energy efficiency pilot designed to redefine best practice in energy management by identifying opportunities through big step innovative advances. Amcor's beverage and packaging divisions had already demonstrated success working with EEBP.

The Botany Mill was identified as the best placed to participate in the EEBP program. Amcor is an existing member of the Sustainable Energy Development Authority (SEDA) Energy Smart Business program and had already identified and implemented energy savings projects achieving a combined savings of \$608,000 and avoiding 11,500 tonnes of carbon dioxide emissions.



## THE CHALLENGE

A major challenge to Amcor's participation was that management had previously committed considerable time and resources into optimising the steam utilised within the paper production process and doubted whether further investigations into energy use would realise any significant opportunities or cost effective improvements. However, the significant improvements achieved by other industry sectors participating in the BEP projects led Amcor to agree to review site operations and plant performance to determine if similar opportunities for energy savings could be realised.

After an initial site assessment, a consultant team with specialist steam and boiler experience concluded that further opportunities for energy saving were present, particularly in the boiler plant and steam distribution and condensate return system. Subsequently, site management gave strong support to the project.

## THE APPROACH

The project followed the Big Energy Project (BEP) methodology, which had been successfully tested across a range of industry sectors. The BEP process is based on the premise that big step improvements in performance are possible over a relatively short time scale through a facilitated, intensive, specialist-augmented workshop process working alongside company staff.

The BEP process involved the following stages:



- A 15-member team comprising external consultants, Amcor staff and ITR's project manager visited the Botany site to gain an understanding of the paper making process, of how steam was used on site and its role in the production process.
- The site visit was immediately followed by an intensive two-day facilitated innovation workshop designed to explore opportunities and challenge assumptions and existing ideas, methods and processes. This collaborative approach generated a high level of mutual respect among the team. Each participant was able to appreciate the skills and knowledge others brought to the workshop, from the detailed operational knowledge of the boiler operator to the theoretical and design understanding of the specialist. The implications were clear – this was a team effort – and for the first time the resources required to achieve the desired output were all assembled in the one place.
- Once a comprehensive understanding of the issues was achieved, workshop participants engaged in a free exchange of ideas to identify plant, equipment and process opportunities which would jointly improve production and energy efficiencies.
- Finally, the team divided into groups to further develop the opportunities into business cases which eventually formed the basis of a comprehensive energy management strategy.

Following on from the BEP workshop, an energy specialist was assigned to the site to provide hands-on support, progress the implementation of specific opportunities and ensure that the momentum gained through the innovation workshop was not lost. The specialist also provided a coaching and mentoring role, working with Amcor staff to further develop their skills.

## EXPLORING THE BOUNDARIES

Prior to the workshop, ITR representatives and the consultant team had worked together with Amcor Botany staff to review existing operations and map key energy flows and production demands, resulting in a background paper used as a basis for discussion.

The General Manager of the Botany site, Shaun Kilmartin, opened the workshop by stating his commitment to the process: “We are determined to make this successful by having a real goal to deliver tangible results, and so I am very excited and very determined to get something out of this process. We have enthusiastic staff [here] with very wide experience. The mill is not pretty – it’s old, but it’s full of potential and we’re putting a lot of heart and soul into the renovations. This workshop is critical in going to the next stage, and we see heaps of potential in it for us.” Shaun encouraged the team to think laterally and not to be bound by costs. He saw the workshop as an “opportunity to think that possibilities can become realities”.



Commenting on the workshop for all present, Peter Dobney, National Energy Manager for Amcor said: “The degree of experience and intelligence in this room, both internal and external, focusing on energy in the right climate at the one time has been huge and something that has not happened before.”

Over two days workshop participants actively discussed and pursued a wide range of potential opportunities, identifying over 120 with direct implications for improving plant performance and reliability -- from introduction of a boiler management system, to heat recovery, to utilisation of biogas from the waste treatment plant as an energy source. The possible had become reality.

The workshop ended with a presentation to Shaun Kilmartin, who told the group that “the workshop opportunities are even more positive than I had originally thought. The real challenge now is to prioritise [them] and I will make the commitment to address these opportunities and get things happening. I’m really amazed at what’s come out in these two days – it’s mouth watering.”

## IMPLEMENTING PROJECTS AND GETTING RESULTS

The BEP workshop highlighted the need for additional support for energy management at the plant. In particular, there was a need to build upon existing energy saving initiatives and to provide assistance to on-site staff ready to accept the challenge of taking energy management to the next level. Amcor also recognised the need for additional support to assist in developing a capital expenditure rationale in order to access the corporate energy fund.

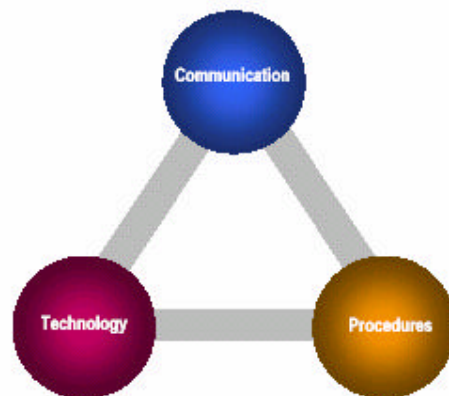
***“the workshop opportunities are even more positive than I had originally thought”***

*Shaun Kilmartin,  
General Manager -  
Amcor Bontany*

The approach adopted followed the Best Practice People and Processes (BPPP) methodology developed to support the outcomes of the BEP process.

The fundamental philosophy of the BPPP process is the Technology—Communications—Procedures model (TCP) shown in Figure 1. The success of the BPPP process is based on overcoming common organisational barriers to energy management by directing attention to policy and procedures as well as people and site communication issues.

**Figure 1: The TCP model**



The BPPP process for Amcor was designed to augment and build upon any energy work planned or already underway and to complement their involvement with the SEDA Program. In this instance, given the large range of opportunities identified, the consultant who prepared much of the background paper provided additional energy management support to Amcor over a period of ten weeks. This was undertaken to support the incumbent Energy Champion, Robert Simpson (Stock Preparation and Mill Services Superintendent at Botany); to co-ordinate discussions with other key stakeholders such as Amcor's National Energy Manager, SEDA and ITR; and to ensure maximum benefits were achieved in a relatively short timeframe.



Three targets were associated with this external support:

- reducing site energy costs by over \$200,000/yr in six months;
- beginning a process of organisational change management toward an energy conservation culture;
- developing a three-year fully-costed energy improvement strategy and supporting Amcor's successful capital expenditure application.

A weekly timetable breaking down the desired outcomes into discrete manageable tasks ensured that the principles of the BPPP process (technology, communications and procedures) underpinned the program at every stage.

The immediate response to the mentoring program was extremely positive. Robert Simpson noted: “We have [had] excellent results and quick wins with immediate changes. We have involved the operators in the energy efficiency work, and our engineering staff is very pleased with the work on the capital projects. Without this support and coaching they would not have been able to do the necessary work for the capex.”

## RESULTS AND ACTIONS

Ultimately fifteen discrete energy saving opportunities were identified which had the potential to realise savings of in excess of \$1.65 million per year.

For each of the energy projects identified, a standard engineering approach was utilised; namely to identify the strengths, weaknesses, opportunities and threats associated with the specific item of plant. Commonly known as a SWOT analysis, it assists in focusing limited resources on major issues. It recognises that opportunities and threats are part of the external environmental in which every company operates and things happen outside the control of the organisation (eg, increasing energy costs). While it is not possible to correct all weaknesses, it is possible to concentrate on those weaknesses which are barriers to the long term success of the business.

An example of the analysis undertaken for one of the energy projects – No 8 Machine Steam System – highlighted the following issues:

- a high level of understanding of paper machine process and associated equipment (*strength*);
- old control equipment becoming unreliable (*weakness*);
- greater reliability of machine and hence improved quality control on paper produced (*opportunity*);
- need for continual review of operational effectiveness, for benefits to be realised (*threat*).

Projects deemed to still meet internal criteria after SWOT analysis were explored in more detail. These projects were grouped into two key areas: operational improvements; and underlying inefficiencies.

## OPERATIONAL IMPROVEMENTS

### ***Maintenance***

- Repairing steam and condensate leaks, estimated at approximately 0.5% or the cost of providing steam to the site
- Reinstating three steam traps, saving up to 200t/yr of steam per trap.



**At the end of the initial ten-week period, over \$650 000 of savings had been confirmed and \$240 000 of savings had been fully implemented.**



### ***Process optimisation***

- Increasing boiler water conductivity to 800  $\mu\text{s}$ , halving the blowdown and saving nearly \$30 000/yr in fuel, water and treatment costs
- Re-commissioning and recalibrating boiler air-fuel ratio controller to run at design excess oxygen levels, improving boiler efficiency by 0.25%
- Monitoring closely steam control operation on No.8 machine, identifying repairs to faulty equipment and resetting control parameters, currently saving 2t/hr or 2.75% of site steam use

### ***Training and information***

- Ranging from showing boiler operators how to recalibrate blowdown controllers, to training machine superintendents on the setting of steam controls
- Benefits, while hard to measure, could be as high as 3% of site steam costs

## **UNDERLYING INEFFICIENCIES**

Underlying inefficiencies occur when the fundamental design of a process or equipment is not optimised to minimise energy use. Resolution inevitably requires capital expenditure, although payback can be very good.

### ***No.8 Machine vacuum condenser***

- Nominal low pressure condensate is cooled in a condenser under vacuum, removing energy from the condensate and dumping to effluent. A redesign project developed to recover this energy has the potential to save over \$20 000/yr with a payback of just over one year.

### ***Reducing No.7 machine use***

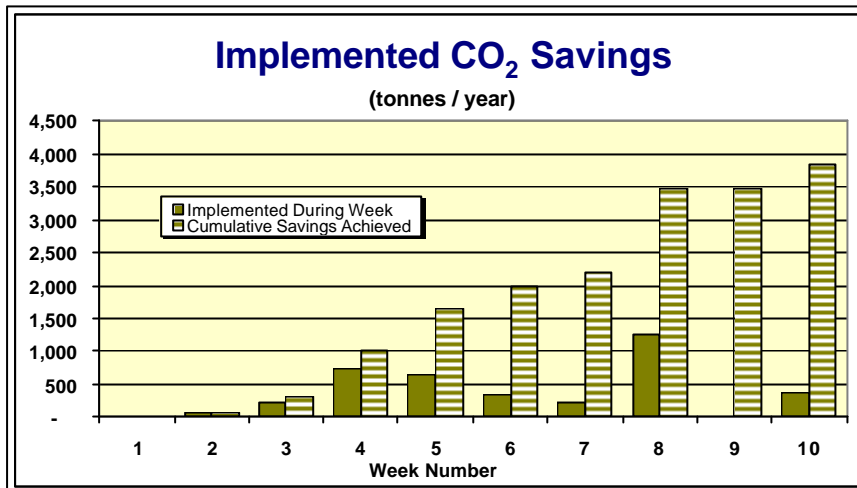
- A Programmable Logic Controller (PLC) paper temperature controller will be installed to recover additional flash stream, with cost savings calculated to be over \$200 000/yr with payback under 1.5 years.

## **SINGLE FINANCIAL TARGET TO REDUCE SITE ENERGY COSTS BY OVER \$200 000 IN SIX MONTHS**

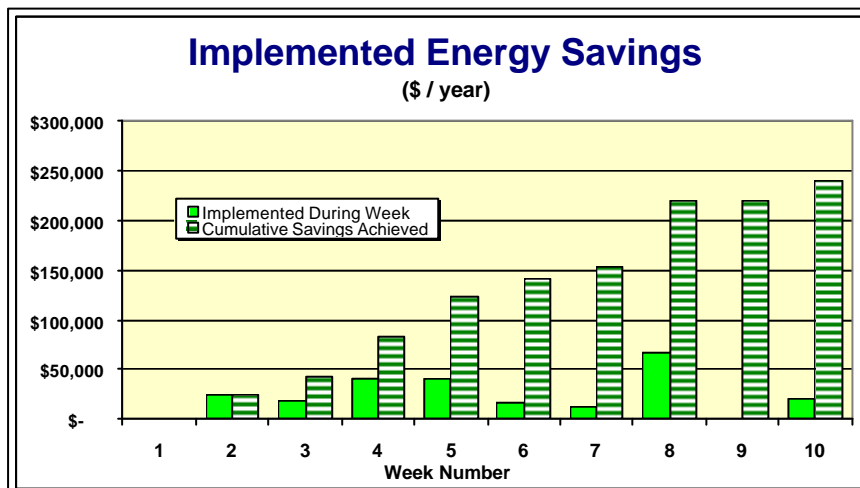
At the end of the initial ten-week period, over \$650 000 of savings had been confirmed through more detailed engineering assessments and \$240 000 of savings had been fully implemented.

Summaries of the weekly progression of energy and CO<sub>2</sub> savings are presented as follows (refer Tables 1-1 and 1-2).

**Table 1.1: implemented CO<sub>2</sub> savings (tonnes/year)**



**Table 1.2: Implemented Energy Savings (\$/year)**

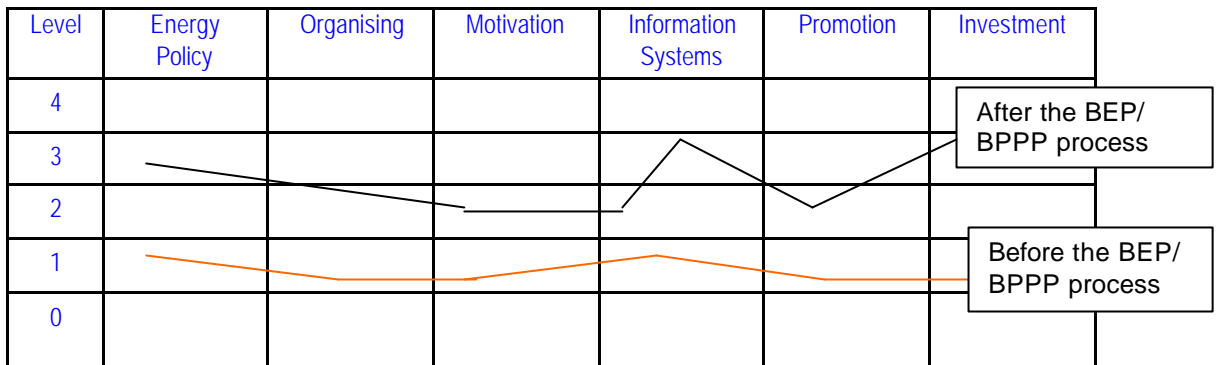


## ORGANISATIONAL CHANGE

Just as impressive as the energy and greenhouse savings is the demonstrable change within the organisation. Prior to the BEP there was a lack of formal structure with respect to energy management. At the end of the BEP/BPPP process, energy is no longer regarded as a marginal issue and is becoming the concern of the whole organisation. (refer Table 1.3)



**Table 1.3: Energy Matrix**



### FUTURE PLANS

A three-year energy improvement strategy has been developed in conjunction with site staff to progress opportunities identified to date and to incorporate within the organisation an approach to energy management to ensure that energy remains at the forefront of the company's agenda.

This plan, if fully implemented, will see Amcor realise over \$950 000 in savings per year, equating to more than 20 000 tonnes of carbon dioxide.

This is an additional \$950 000 over the \$608 000 yearly savings implemented in 2001 under the SEDA-sponsored initiative and the \$650 000 savings identified and evaluated as part of the BEP/BPPP process, bringing the total to over \$2.2 million in savings.



### THE KEY BENEFITS

Energy management role can be a catalyst for a range of issues, not just energy. By involving people and making things happen, it can break the artificial barrier of “core” vs. “non-core” activities. This was clearly demonstrated at Botany with one of the papermaking machines achieving record production rates following implementation of steam controls, which will also result in energy savings of \$20 000 per year.

Whilst the BEP ensured commitment and focus for energy management, it was also instrumental in accelerating normal learning processes and through exercises in lateral thinking demonstrating that “change is possible”. It also added “urgency” to the process by having dedicated outcomes being energy focussed.

The BEP/BPPP process emphasised that any energy management exercise, is not a single process – it is about building capacity, developing systems and providing analysis on a day-to-day basis.

Overall, four key benefits were achieved from participation in the project:

- ***Energy and greenhouse gas reductions through more efficient operations***

Although implementation of the projects is ongoing, the team has achieved measurable cost savings and reductions in greenhouse gas emissions associated with energy use at Botany.

- ***Improving staff understanding of site operations and involving staff directly in operational improvement***

Staff reported that they learned more about how the site worked and had greater opportunity to improve operations and procedures. For many, this improved job satisfaction.

- ***Building staff experience and skills***

The emphasis of the Best Practice People and Processes approach on building capacity to manage energy efficiency at site level, led to a new range of skills for team members. Participating in the project enabled staff to gain a better understanding of energy and greenhouse issues. Recognising the opportunities and benefits that can be realised, Amcor has now appointed an energy manager to the site on a permanent part-time basis.

- ***Cross-sectoral gains***

Utilising external experts resulted in experience in process control gained in the chemical industry being integrated into procedures on product quality within the paper industry.

The project has led to improved production and improved environmental management through reduction in energy use and greenhouse emissions. With systems embedded into the organisation, the momentum for energy management will continue, ensuring that energy will remain a “visible” input, to be managed for the life of the plant.

Amcor hopes to roll-out the same process to its other paper mills, starting with Fairfield in Victoria.



#### **ENERGY EFFICIENCY BEST PRACTICE**

Australian Government Department of Industry, Tourism and Resources  
GPO Box 9839, Canberra City ACT 2601  
Telephone: 02 6213 7878 Facsimile: 02 6213 7900  
Email: [energy.bestpractice@industry.gov.au](mailto:energy.bestpractice@industry.gov.au)

**Web site: [www.industry.gov.au/energybestpractice](http://www.industry.gov.au/energybestpractice)**

ITR 2003/111

NOVEMBER 2003