

# Reducing Business Costs



## Saving Money through Resource Efficiency

October 2006

FUNDING PARTNERS





ACN 007 061 930

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Saving Money through Resource Efficiency

# Resource Efficiency Workbook

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## How can my Business Save Money?

*What is Resource Efficiency and how can my business save money?*

Resource Efficiency is a business management technique which will enable our organisations to reduce daily operating costs, increase margins and generate more saleable products by using fewer raw materials. This can be done by improving the efficiency of our raw material and utility demands as well as through limiting the generation of waste products which inflate the costs of production and reduce revenue.

Resource Efficiency is about making more with less. As markets become more competitive we are constantly looking for opportunities to reduce the costs of production and increase profits. Resource Efficiency can help our companies find reductions in resource and utility demands and make our organisations more profitable.

The following is a short list of how companies can benefit from reducing resource and utility consumption:

- Increase productivity
- Increased economic performance
- Increased margins
- Improved environmental performance
- Reduced waste storage costs
- Reduced operational costs
- Reduced logistics costs
- Increased marketability
- Reduction in utility costs
- Improved awareness of True operating costs
- Reduce disposal and transport costs
- Better reporting opportunities
- Reduced risk of compliance related issues
- Reduced Greenhouse emissions

### The True Cost of Waste

With a basic analysis of our factory's solid and liquid wastes, we can identify how much of our raw materials, labour, energy and water is actually being wasted by producing by-products that are not saleable.

Waste disposal costs represent the tip of the iceberg when analysing the TRUE costs of waste.



**Did you know that the True Cost of waste is actually between 10 to 30 times the cost of disposal?**

**This equates to approximately 4.5% of turn over.**

For example, if our annual waste disposal cost is approximately \$10,000, it is more likely costing us between \$100,000 and \$300,000 in wasted resources.

*How can this be true?*

Every time we produce waste and/or trade waste, we are wasting energy, labour, raw materials, water, time, and saleable products by generating by-products that we cannot sell.

Remember, any waste generation is product or utilities that we have bought to make a product that is no longer available for sale. Therefore if we can't transform raw materials and utilities into saleable products then why should we produce it in the first place?

If we can increase our product yields (even by a few percent) and reduce the amount of raw materials and utilities required to make a unit of product, then our organisations can be considerably more profitable.

While this may seem a little daunting at first, it really is a relatively simple process that should be incorporated into our daily operations.

The cost of raw materials and loss of potential sales is a primary concern for our organisations. The next time we pass our bins or are paying our water and energy bills, ask ourselves "WHY are products that I have bought and spent money on, being wasted"?

**Case Study**

Company X is a Melbourne based food manufacturing business with 50 employees. They currently spend approximately \$10,000 each year on solid waste disposal and close to \$30,000 each year on water and trade waste.

After looking at their wasted raw materials, wasted labour and related costs, they saw the actual amount that they were spending on product going to the bins and sewer was actually closer to \$250,000 annually. It was a shock to the company because, this waste component was only between 2-5% of total production and previously considered acceptable until the "True" costs were identified.

**Saving Money**

Most companies small, medium, and large and across the majority of industry sectors generate some form of both solid and liquid wastes. The questions to ask ourselves are "What part of this waste is valuable to our organisations?" and "Can we reduce them in any way?" This will save our companies considerable sums of money which may go to purchasing new machinery, hiring more staff, doing more promotions or simply buying a new coffee machine.

The next time a load of "waste" goes to the bin, or when paying our water and energy bills, think about the total amount of money we have paid for our raw materials, labour, energy and water. Then ask ourselves "Why this money is being thrown away or emptied down the drain?"

The most important thing to remember is that it need not cost us any money to become more efficient with our raw material use. If anything, it should save us money.

## How can AiGroup help?

The AiGroup can help our companies increase profitability and reduce risks to become more competitive, hire more staff, generate more profits and gain an edge in the market place.

AiGroup will help us think about the resources and utilities that we use to generate products and to increase their performance and efficiency to produce more with less. By changing a few simple things around our sites, we can significantly reduce the cost of doing business.

Essentially we can help your company produce more with less.

We can:

- Conduct an on-site Resource Efficiency and Waste Assessment
- Identify reductions in Solid Waste, Trade Waste, Water use, Energy Demand and Resource Consumption, which may lead to reduced operating costs and greater productivity
- Develop and assist with implementing action plans and monitoring plans as well as provide ongoing support
- Help you to access available government funding opportunities
- Reduce costs and increase performance
- Develop project plans, staff training, and identify new market opportunities
- Conduct supply chain assessments and increase networking opportunities to encourage resource trading
- Develop and cultivate alliances with water authorities, local and state governments and stimulate media opportunities
- Provide Access to information and Case Studies pertinent to your industry, and Identify Environmental Risk opportunities
- Provide a link to EPA and Sustainability Victoria for assistance
- Provide you with helpful materials
- Identify Environmental Risks

## What can I do?

Implementing a Resource Efficient Management structure into our organisations is a relatively simple process. We need to have commitment from senior management as well as process staff process to encourage uptake. The most important thing to remember is to keep the program simple and always look for ways to improve. After all, it is in the best interests of our own business to reduce our operating costs and improve our environmental footprint.

Looking for opportunities to increase our product yields should be second nature and we shouldn't tolerate any inefficiency. A good maintenance plan is often the key to solid product and process performance. The following section will help you develop an approach to resource efficiency and financial returns.

## 6-Steps to Resource Efficiency and Financial Returns

There are 6 simple stages to consider when embarking on a Resource Efficiency Plan. It is recommended to keep the process as simple as possible and concentrate on outcomes. Be sure to engage staff and let them know of the company's new direction. It is also important that staff feel empowered to make suggestions for change. More often than not, our production teams already have the answers and ideas for money saving. They are just waiting to be asked.

*The 6 simple steps to Resource Efficient Management are:*

1. Planning and Organizing
2. Conducting a Site Assessment and process mapping
3. Data Collection and True Cost Analysis
4. Developing an Action Plan
5. Implementing the Action Plan
6. Monitoring and Continuous Improvement

These 6 steps are merely a guide to help us form a simple plan for increasing our process optimisation and reducing operational costs. And need to be tailored to our business conditions. By following these 6 stages, we will be able to develop a simple strategy that is complementary to our management methods.

### 1. Planning and Organizing

- Make a commitment to become more efficient with resources and utilities
- Develop indicative targets, goals and objectives of what we would like to achieve. For example, we may want to aim for a 25% reduction in waste, water, energy and/or labour costs
- Identify the staff who will work on a resource efficiency team. This should include senior management, production managers and operational staff with regular meetings. It is also useful to include External Resources such as someone foreign to the company. People who are not familiar with the organisation tend to ask the simple questions about our processes and procedures.

### 2. Conducting a Site Assessment and Process Mapping

Use the attached checklists for guidance.

- Be systematic. Start from where goods enter the factory, through to processing and finally where goods are packaged and stored for delivery. The assessment should include a look inside your bins and an observation of the services.
- Draw a simple process flow map. Outline where raw material enters the site, the main process steps and the utilities consumed at each process.
- Where are wastes being generated?
- How is cleaning done?
- Are there any leaks or spills that could be fixed?
- Am I losing any product at transition points?
- Consult with your floor staff
- Check each processes and product line
- Check services and equipment (boilers, compressors, conveyors etc)
- Ask Questions. WHY? Is it necessary? (Having someone who is not familiar with the business is helpful to ask these questions)

### 3. Data Collection and True Cost Analysis

- Record utility data for the previous two years using Worksheet Number 1. This should include energy, water and trade waste, waste transport and at least 3 of your major raw materials. This will help to identify our company's performance over the last 2 years and develop a snapshot of the current processes for which to benchmark against in the future.
- While we know the effect of changes that we make, it is very important to our business's to track and record these changes.
- Measure your waste generation for each process or product line over a week's duration and extrapolate for a year using Worksheet Numbers 2 and 3.
- How much does waste, water, energy etc **REALLY** cost us? (include, loss of raw materials, labour, energy, water and trade waste, loss of revenue if possible)
- Use the outcomes from this process to identify areas of opportunity
- The TRUE cost of waste is often between 10-30 times the costs of disposal. This equates to approximately 4.5% of total turnover
- Develop a Process Flow diagram of the site to highlight utility and raw material consumption.

### 4. Developing an Action Plan

Refer to the attached template for guidance

- Make the Plan outcome focused
- Make it simple and easy to follow recommendations
- Assign timelines and responsibilities to key personnel
- Tackle the simplest, most cost-effective issues first and develop the program from there.

For example, we may have identified that a large percentage of wasted raw materials are generated from one specific product line. It is important to identify this opportunity and develop a plan which will target a reduction of this waste. We will see worthwhile returns for our efforts and will also encourage staff to look for other opportunities.

Do not be afraid to set ambitious targets. Use these goals for inspiration, innovation and creativity to improve each year. For example; let's assume we set a goal of reducing our water consumption by 50% for the year and we only achieve a 25% reduction. This is still a massive reduction in our water use and therefore should be rewarded. If however, we had only set ourselves a 5% reduction target and achieved this target then we have possibly missed out on extra savings that we may have benefited from.

### 5. Implementing the Action Plan

- Prioritize Actions from the most cost-effective with no capital costs to those that may require capital investment. It is important to highlight all the opportunities
- Identify where the largest percentage of waste is being generated and target this area first. It is often useful to have a site map or a simple process flow diagram illustrating the material and utility allocations for each area of the site
- Start with opportunities that have direct financial benefits for no capital expenditure, that is the "Low Hanging Fruit"
- Identify 1 or 2 key waste streams or utilities as opportunities and tackle them first. Once these changes have been made re-evaluate and then tackle the next set of utilities on the list.
- Track and chart everything. (It is much easier to see the results in a graph than to read about them)

For example; we may have identified some issues with both solid waste and liquid wastes. Start a program which targets solid waste to get some immediate savings. This will make the program much simpler. Once you have developed and implemented a solid waste reduction plan and the staff is delivering the results that we want, look at developing a new program for our liquid wastes.

It is very important to introduce the program slowly and obtain ownership from all levels of staff, particularly the senior management.

Establish a form of "Station Control" for staff. Show graphs of performance at strategic locations throughout your site and in staff rooms for waste, raw material and water use reductions. Reward ideas and empower staff to increase awareness and ownership.

## 6. Monitoring and Continuous Improvement

- Monitor and Track the program and the results that we achieve.
- Encourage continuous feedback and rewards for staff.
- Look at justifying any capital expenditure with costs saved through the program.
- What is the payback period and is it acceptable to our organisation?
- Set new targets, goals and objectives
- Start the process again and look for further opportunities.

Remember this is not a once off project; it should become part of our daily operations to make sure that our facilities are running at an optimum efficiency. Ultimately, these little checks will save our company's money.

There is a distinct need to start to think of Resource Efficiency, Cleaner Production or Environmental Performance as an Economic opportunity and not simply as a compliance cost. In our business's, we are either directly or indirectly doing this already but possibly don't appreciate what we have already built into our operations as "Good Management".

All companies have some sort of management method that allows them to analyse product or batch yields and are constantly striving to increase the performance of this product or process line in terms of process optimisation. By administering these management strategies, we have already made a conscious effort to reduce our demand on resources such as energy, water, waste water, raw materials and labour. If we include each of these utilities in this yield evaluation then we should already performing exceptionally well.

Since we are already conducting this process we might as well report on our performance (kill two birds with one stone). This will help with any future compliance issues, potentially reduce your liabilities and insurances', and open up new markets both domestically and internationally as larger companies and governments across the globe begin to demand environmental reporting in order to satisfy future contracts. This is again, another financial win for our organisations.

## Utility Analysis

The following Worksheet (Number 1) has been designed so that we can input our utility use for the previous two year period. This is a very important component of developing an action plan. While good practice is the essence, tracking our performance allows us to identify goals, targets and appreciate our successes.

This worksheet should be integrated into our accounting process. You may wish to analyse your utility and resource demands on a monthly, quarterly or annual basis depending on your requirements.

The major purpose of this worksheet is to enable us to very easily identify with what percentage of utilities and resources we require to generate a certain volume of product. If we increase our productivity and efficiency on any particular product or process we will be able to observe this from this chart.

A quick way to determine how you are tracking is to simply compare the utility demands as a percentage of production for the previous two years. How are you tracking? Are there areas that we have improved upon? Are there areas where we could increase our performance for the following year?

**Note:** The following Worksheets/Excel Spreadsheets are available as electronic copies. Please contact Matt Walker from AiGroup for your copy.

### **Filling in Worksheet Number 1**

Step 1: Please try to fill in as much of the data in the worksheet (in the blank cells) for each of the years.

Step 2: If time is an issue, please complete the annual data only.

Step 3: The yellow cells will calculate automatically. You should be able to obtain an instant snapshot of your company's performance compared with the previous few years.

### **Developing an Industry Benchmarking Tool**

With your permission, the information generated by your organisation in this worksheet will be used to develop an industry benchmarking tool. The industry benchmarking tool, aims to identify the resource use and utility demands per unit of production for industry in Victoria.

Once we have compiled the tabulated data of 500+ organisations, we will forward you the findings so that you can benchmark your organisation against other similar organisations with respect to resource consumption and utility demand. If you would like to participate in this opportunity could you please email or fax a copy of your worksheet to Mathew Walker at the Australian Industry Group [\*\*mwalker@aigroup.asn.au\*\*](mailto:mwalker@aigroup.asn.au)

Note: This information is highly confidential and will be treated as such. For purposes of confidentiality, company information and company names will not be included in the final benchmarking tool.

The Australian Industry Group would like to thank you for your time and hopes that the final product can be beneficial to your organisation.

**Worksheet Number 1: Utility Analysis**

Year	Month	Production (tonnes)	Energy	Electricity (kWh)	Electricity (\$)	Gas (GJ)	Gas (\$)	Water	Water In (kL)	Trade Waste (kL)	Total Water cost (\$)	Waste	General waste (m <sup>3</sup> )	General waste (\$)	General waste (No. of collections)	General Recycled (m <sup>3</sup> )	Raw Materials	Raw Material 1 (tonnes)	Raw Material 2 (tonnes)	Raw Material 3 (tonnes)	
2004-2005	Jul																				
	Aug																				
	Sep																				
	Oct																				
	Nov																				
	Dec																				
	Jan																				
	Feb																				
	Mar																				
	Apr																				
	May																				
	Jun																				
<b>Totals</b>																					
<b>Total/Production</b>																					
2005-2006	Jul																				
	Aug																				
	Sep																				
	Oct																				
	Nov																				
	Dec																				
	Jan																				
	Feb																				
	Mar																				
	Apr																				
	May																				
	Jun																				
<b>Totals</b>																					
<b>Total/Production</b>																					
2006-2007	Jul																				
	Aug																				
	Sep																				
	Oct																				
	Nov																				
	Dec																				
	Jan																				
	Feb																				
	Mar																				
	Apr																				
	May																				
	June																				
<b>Totals</b>																					
<b>Total/Production</b>																					

## Site Waste Recording

The following Worksheet (Number 2) is designed to obtain a simple snapshot of the waste generated from the various product or process lines within your facility.

The most effective way to use this worksheet is to print out enough copies for each process in your facility and stick them up close to where the waste is being generated. Record the number of bins that you take away from the area throughout each shift over an indicative weekly period. Remember, this is a snap shot so some variation is acceptable.

It is best to let staff know that we want them to fill these sheets in as accurately as possible and that there are no repercussions for the waste generation from their sections.

Input the waste weights generated in this worksheet into Worksheet Number 3 to obtain a simple analysis of the true costs associated with your waste generation.

It is worth noting that this worksheet can be used for water use, trade waste or energy within your site. This worksheet is designed to give us a brief indication of our wastes and attempt to place a dollar value on them to identify with opportune areas within our sites.

There are many more tools that help will identify resource efficiency opportunities for our organisations in far more detail. If you would like to analyse your resource and utility consumption on a more micro level then please contact AiGroup, Sustainability Victoria or EPA for more detailed workbooks and accounting tools.

**Worksheet Number 2: Waste Recording**

Step 1: Use one of these worksheets for each of your process and or product lines to record the waste weights over a week's duration.

Step 2: Transfer the total weights from this Worksheet into Worksheet Number 3 for each of your processes and or products.

Week ending:			Waste Weights						
Shift & Date	Product Line	Waste Bin	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Day		No. of Bins (Total weight,kg)							
Afternoon		No. of Bins (Total weight,kg)							
Evening		No. of Bins (Total weight,kg)							

**Note: Please make a note each time you empty a bin**

Note: The number of bins refers to the number of bins/boxes etc (waste receptacles) that are filled with waste from each process or product line each day.

Whenever a staff member empties a bin from the processes, make sure to put a dash in the corresponding day or shift so that the total amount of bins can be recorded for the day.

Once the total amount of waste bins have been tallied for the day, make an estimate of the total weight (kg) that this represents so that this figure can be used in the following worksheet.

## True Cost Analysis

Use the information generated in Worksheet Number 2 above to determine an indication of the wastes that are generated from each process area for your site over a yearly basis. Remember that this is an indication so a certain degree of variation is tolerable. If you have significant seasonal differences then manipulate the figures to reflect these variations in demands to more adequately represent your waste generation.

Input this information into Worksheet Number 3. You will notice that there is a multiplier function (in the yellow cells) that simply multiplies the input figures generated in worksheet Number 2 for a one year period.

You will also be required to input a cost per unit of production for raw materials and labour. Remember, this worksheet has been designed to give you a simple snapshot of your wasted resource costs. There will be a variation with other utilities as it does not account for wasted energy, water or trade waste. However you can either include these factors in these sheets or simply add 10% onto the final figure.

### Using Worksheet Number 3 to find Savings

Step 1: Input the data generated in Worksheet Number 2 into Worksheet Number 3 for each process.

Step 2: Use one of these worksheets for each of the process and product lines measured in Worksheet Number 2.

Step 3: Multiply through for an indicative week, month and year to establish an indication of your losses.

Step 4: Use Worksheet 3.1 to add up the totals for each of the process and or products to work out the "True" cost of your wasted resources.

**Worksheet Number 3**

Use one of these worksheets for each of your processes and/or products.

Once you have completed these worksheets, use Worksheet Number 3.1 below to add up the total waste costs for your facility.

Process 1	a	b	c	d	e	f	g	h	i
Week Ending:	Product (kg/day)	Waste (kg/day) (from Worksheet No. 2)	% Waste (b/a)	Raw Material cost (\$/kg)	Raw Material (\$-total Product) (axd)	Waste Product (\$) (cxe)	Labour cost (\$/kg)	Labour (\$-total Product) (axg)	Waste Labour (\$) (cxh)
Mon									
Tue									
Wed									
Thur									
Fri									
<b>Ave/day</b>									
<b>Ave/week</b>									
<b>Ave/month</b>									

Process 1	Product (kg/month) (total a)	Waste (kg/month) (total b)	% Waste	Raw Material (\$/month) (total e)	Waste Product (\$) (total f)	Labour (\$/month) (total h)	Waste Labour (\$) (total i)
Jul-05							
Aug-05							
Sep-05							
Oct-05							
Nov-05							
Dec-05							
Jan-06							
Feb-06							
Mar-06							
Apr-06							
May-06							
Jun-06							
<b>Totals</b>							

**Worksheet Number 3.1**

Use this worksheet to add the true costs of raw materials and waste generated from the various processes within your facility.

Process for July 05 - Jun 06	Product (kg/year)	Waste (kg/year)	% Waste	Raw Material Cost (\$/year)	Waste Product (\$/year)	Labour (\$/year)	Waste Labour (\$/year)
Process 1							
Process 2							
Process 3							
Process 4							
Totals not including energy, water etc							

## Site Assessment Checklist

Use the checklists provided. When conducting a site assessment it is often very useful to have someone involved who is not related to the company (ask AiGroup). This person will generally ask the simplest questions about WHY something is occurring. Often these issues are the most important to your potential savings?

For example: Why is that machine leaking? Why is that packaging machine not working properly? Why is there product on the ground under that conveyor?

These are questions that we as business owners know the answers for so never ask ourselves. It is important to remember that these simple questions are the ones that save us money!!

It is equally important to let staff know that we trust and value their input. More often than not, problems causing waste can be fixed through simple solutions that staff has already identified. A small incentive can often generate significant savings.

When conducting a site assessment, begin the assessment from where your raw materials enter your site and work your way through the process to where the final products are packaged and stored for distribution.

Draw up a process flow map as you walk through the site. The process flow map can be as simple as a block diagram with arrows to indicate each input and output at each process stage.

Be sure to analyse your bins, trade waste discharge, water use and your services for additional opportunities. What percentage of each utility such as water, and energy is used in which areas throughout the site? A simple indication will enable you to identify the areas with the biggest opportunities.

**Site Assessment Checklist**

Site	Actions	Comment
Storage	<ul style="list-style-type: none"> <li>▫ Is stock being rotated?</li> <li>▫ Can I order my materials in larger returnable containers (ask supplier)</li> <li>▫ Will my supplier pick up containers once they are emptied?</li> <li>▫ Are my raw materials in reusable or recyclable containers and or bags?</li> <li>▫ Look for opportunities to use any residual product left in containers before disposal.</li> <li>▫ Use compactors/bailers where possible for plastics and cardboard to reduce space and handling requirements.</li> <li>▫ Engage a recycling merchant to recycle your plastic film wastes and rigid container wastes.</li> </ul>	
Processes	<ul style="list-style-type: none"> <li>▫ Check for leaks</li> <li>▫ Check for spills</li> <li>▫ Check for wasted product at transition points</li> <li>▫ Can I do this another way?</li> <li>▫ If machine is causing waste, ask WHY?</li> <li>▫ What can we do to stop this waste from being generated?</li> <li>▫ Measure the quantity of all wastes over an indicative week and extrapolate for the year. This will help identify problem areas and assign a dollar figure to justify required expenses.</li> <li>▫ Is waste generated by inefficient operating procedures, poor process control, poor staff awareness or lack of maintenance?</li> <li>▫ Are guards in place to prevent product loss?</li> <li>▫ Are guards in place to capture any product loss before it comes in contact with the ground? This will enable you to reuse this product and reduce your trade waste and solid waste charges.</li> <li>▫ Can leaks be repaired promptly?</li> <li>▫ Is the process too fast that it creates product loss?</li> <li>▫ Introduce operational procedures to reduce waste generation.</li> <li>▫ Can colours and flavours be worked up during the day to prevent excess product loss between batching?</li> <li>▫ Can product loss be reused?</li> <li>▫ Is all available recycling being conducted on site and are staff fully trained to use the appropriate recycling receptacles'?</li> <li>▫ Can product used for packaging be updated so that it is recyclable?</li> </ul>	
Packaging	<ul style="list-style-type: none"> <li>▫ Are the packaging machines working properly?</li> <li>▫ Why is there packaging waste and wasted product?</li> <li>▫ (Remember once product is ready to be packaged we have already spent a considerable amount of money on raw materials, energy, time, packaging, printing, labour etc and therefore any waste at this stage is a massive loss to our companies and should not be tolerated).</li> <li>▫ It will be almost certainly cheaper in the long run to fix faulty machinery and reduce wasted products forming at this stage. Engage manufacturers and suppliers where possible.</li> </ul>	
Batching	<ul style="list-style-type: none"> <li>▫ Am I running one full line before changing batches?</li> </ul>	

	<ul style="list-style-type: none"> <li>▫ Make sure we purge the lines into saleable product before cleaning and changing batches.</li> <li>▫ Can I reuse any waste product?</li> <li>▫ Find more efficient mechanisms of disposing wasted product left in process lines. Do not just discard to the drains.</li> </ul>	
Water use	<ul style="list-style-type: none"> <li>▫ Check for leaks</li> <li>▫ How much water do I use for cleaning? Can this be reduced?</li> <li>▫ Are all services running efficiently?</li> <li>▫ If we use water for cooling purposes, can this water be reused?</li> <li>▫ If we use hot water for motors or cleaning, can I capture this heat through a heat exchanger to increase the temperature of the feed water to reduce my energy demand?</li> <li>▫ Is it possible to replace existing hoses with trigger nozzles and or high pressure nozzles for cleaning to reduce water demand?</li> <li>▫ Can water used for cooling for example be stored and used for cleaning purposes?</li> <li>▫ Can final rinse water be used for pre-wash water where appropriate?</li> <li>▫ How much water is retained in your products?</li> <li>▫ Be sure to inform your water authority of improved housekeeping. This will lower your trade waste charges.</li> </ul>	
Trade Waste	<ul style="list-style-type: none"> <li>▫ High Trade Waste charges are due to wasted resources.</li> <li>▫ Make sure product is not wasted in the first place.</li> <li>▫ Make sure waste does not contact the ground.</li> <li>▫ If waste does contact the ground be sure to dry sweep before hosing dissolved product to drains.</li> <li>▫ Engage a water analyst to conduct a composite water sample. This will enable you to identify with the waste characteristics, develop some baseline data and encourage improved performance to be benchmarked.</li> <li>▫ Make sure you let your water authority know the results of these tests. You may be paying too much for your trade waste due to old measurements.</li> <li>▫ Do you have sieves over each of your drains?</li> <li>▫ Make sure you educate staff to not hose wastes down the drain. This will result in lower trade waste charges.</li> </ul>	
Cleaning	<ul style="list-style-type: none"> <li>▫ Always dry sweep or squeegee before cleaning?</li> <li>▫ Out of site is not out of mind. Dissolved organics will increase your trade waste charges.</li> <li>▫ Fix spills so that waste does not contact the ground.</li> <li>▫ When cleaning machinery use air hoses if possible and dry sweep the floor before final hosing.</li> <li>▫ Use trigger nozzles to reduce water use.</li> <li>▫ Use high pressure hoses where possible.</li> <li>▫ Have a system of station control which measures water use and waste generation from each of the process areas and encourage staff to use less for each station.</li> <li>▫ Use reused water from process cooling if possible.</li> <li>▫ Scrape clean residual product in batching tanks prior to hose cleaning.</li> <li>▫ Check to see if CIP system can include a reuse module.</li> <li>▫ Ensure all products are captured at the end of a batch prior to cleaning to prevent excess BOD loads resulting in elevated trade waste charges.</li> </ul>	

Solid Waste	<ul style="list-style-type: none"> <li>▫ Ask WHY?</li> <li>▫ Why is there waste in the bin?</li> <li>▫ What type of waste is it?</li> <li>▫ Where was it generated from and WHY?</li> <li>▫ Could this waste be prevented?</li> <li>▫ The best way to save money is by eliminating your waste. The next best opportunity is to look for ways to reuse your waste. The last resort should be recycling and land filling.</li> <li>▫ Is there packaging, cardboard, rigid containers, flour bags, pallets etc that could go back to supplier or be recycled.</li> <li>▫ Introduce small compactors/bailers for plastic films and cardboards to reduce space and handling requirements.</li> <li>▫ Ask waste contractor to supply better recycling options?</li> <li>▫ Make sure plastic films etc are being recycled. This is usually cost neutral.</li> <li>▫ Ask waste contractor to supply organic recycling bins instead of throwing in general waste?</li> <li>▫ Alert staff to practices that you want them to follow. This should be second nature to them.</li> <li>▫ Measure off spec product or waste generated at transition points and through packaging failures to determine the true costs of generating this waste throughout the year.</li> <li>▫ Look for ways to stop product falling from process lines</li> <li>▫ Ensure packaging machines are regularly maintained. Remember, product lost at the packaging stage can be a waste of a number of days work and should not be accepted.</li> <li>▫ Is there an opportunity to change raw materials to produce less waste?</li> <li>▫ Can less toxic materials be used to reduce toxic waste generation?</li> <li>▫ Adopt the waste management Hierarchy</li> <li>▫ Are equipment settings optimised to minimise off-cuts and trimmings?</li> </ul>	
Services	<ul style="list-style-type: none"> <li>▫ Are my services being maintained regularly?</li> <li>▫ Can I shut down services overnight to reduce energy load?</li> <li>▫ Fix any leaks in compressor hoses to reduce loss of energy.</li> <li>▫ Are compressors turned off after hours to prevent loss of energy?</li> <li>▫ Use variable speed impellers on compressor motors to reduce energy demand.</li> <li>▫ Lag steam pipes and implement a system for condensate return.</li> <li>▫ Are controls in place to turn off boilers and hot water heaters when not in use?</li> </ul>	
Energy	<ul style="list-style-type: none"> <li>▫ Waste generation and inefficient processes relates directly to lost energy.</li> <li>▫ Engage the AiGroup energy help desk to reduce costs when renewing your energy contracts.</li> <li>▫ Look for energy recovery opportunities. For example look at recovering the heat lost from boiler steam to heat your cleaning water. Look at recovering discharge water in a heat exchanger if it is hot or cold to reduce the feed water temperature.</li> <li>▫ Conduct regular maintenance on machinery and services to reduce energy losses.</li> <li>▫ Can energy be used during off peak times?</li> </ul>	
Material mapping	<ul style="list-style-type: none"> <li>▫ Establish a Material Flow diagram of your facility. This will enable you to get a better understanding of what goes where and if there is any waste being generated.</li> </ul>	

Product or process optimisation	<ul style="list-style-type: none"> <li>▫ Data recording and data tracking</li> <li>▫ Look for opportunities to increase product yields. Traditional practice should not be accepted if it is wasting your company money.</li> </ul>	
Data Collection	<ul style="list-style-type: none"> <li>▫ Record utility demands as a percentage of total production output. This will form a baseline for future benchmarking and performance reporting.</li> <li>▫ Track all wastes and utility use for each process.</li> <li>▫ Implement “Station Control” so that staff knows how they are performing.</li> <li>▫ Record waste generation over an indicative week and extrapolate for a year. Is this an acceptable percentage of my total production and how much is it worth in wasted materials?</li> </ul>	
Self Assessment and Continuous Improvement	<ul style="list-style-type: none"> <li>▫ Set Goals and Targets that are beyond your capabilities.</li> <li>▫ This will</li> <li>▫ Monitor progress daily</li> <li>▫ Reevaluate programs every 6 months</li> <li>▫ Track financial improvements and resource reductions and let staff know about the improvements regularly. This will encourage them to look for more efficient work methods to further reduce resource consumption.</li> <li>▫ Encourage your staff to achieve greater results.</li> </ul>	

## Action Plans

Once you have conducted a site assessment of your facility, use the following templates as a guide to developing an action plan. The best method is to write down every possible observation that you saw during your site assessments and develop a very simple list of opportunities based around these assessments.

Use the following tables to prioritise your opportunities from the least capital intensive to the greatest. While there are often many opportunities to save money by simply improving our practices around the site, there are often times when we are required to invest capital to make the reductions that we require.

**Site Assessment**

The following is a template to be used to enter the observations that you make during your site assessment and to detail the opportunities available to reduce demands on each of these variables.

<b>Process or Product</b>	<b>Assessment</b>	<b>Opportunity</b>
Storage		
Water Use		
Trade Waste		
Cleaning		
Solid Waste		
Services		
Energy		
Processes		
Products		
Packaging		
Bulk Deliveries		
Chemical Use		
Other		

E.g. metal off cuts from mould cutting etc.  
Wasted product noticed under the transfer conveyor.

**List of Priority Actions**

These actions are based on the above observations.

No.	Action	Responsibility	Timeframe
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

E.g. find a way to reduce metal off cuts from mould cutting.

Stop waste from being formed and or prevent waste from contacting the ground from the conveyors.

## Tips

The following is a list of some very simple tips which you can engage at your site that may save considerable, resources, utilities and ultimately time and money. For further Tips, refer to the Tips section on your Discs.

## Water

- Use trigger nozzles where possible
- Use high pressure cleaners where possible
- Reduce water use
- Increase cooling tower efficiency
- Reduce fouling of boilers and cooling towers
- Reuse water for cleaning or gardening where possible. For example, a food manufacturing organisation uses 6,000 litres per day for engine cooling of extruders. By capturing this water, the company is able to save in excess of \$15,000 annually through reduced trade waste charges. Additionally, this waste water is clean and at 40 degrees Celsius and can be stored and used for general cleaning water, therefore reducing energy and water demands.
- Capture surface runoff where possible to be used as cleaning water
- Look at water treatment options if your business is water intensive
- Reduce cleaning demands on water. Imply water saving techniques to reduce the water demand.
- Measure water used in a machine or for cleaning with a bucket and stopwatch and multiply the flow rate by the approximate time you use the water.

For example: A hose used for cleaning can fill a 20 litre bucket in 20 seconds. Since  $Q = v/t$  where  $Q$  = flow rate,  $v$ =volume and  $t$ =time, we know that the flow rate through the hose,  $Q = 20 \text{ litres} / 20 \text{ seconds} = 1 \text{ litre/second}$  or  $0.01\text{m}^3/\text{s}$ .

If for example we use this hose for 30mins to clean the floor we are using;  $1\text{l/s} \times 30\text{mins} \times 60\text{secs} = 1800 \text{ litres of water}$ .

What percentage of our total water bill does this volume of water used for cleaning represent and can I reduce both the flow rate and or the time that I spend cleaning? A reduction in each of these variables will save my company money!!

## Trade Waste

- Dry sweep all areas before hosing
- Make sure product does not contact the ground
- Do not place drains under machinery
- Do not let product go to drains
- Treat water for reuse if at all possible
- Use compressed air to clean machinery
- Reduce your trade waste charges
- Consult your water authority regarding the components of your trade waste which are pushing up prices
- Avoid waste generation
- Educate staff regarding good practice

## Solid Waste

- Avoid waste generation
- Look for reuse opportunities if waste is generated
- Encourage better recycling. Ask your waste merchants to supply additional services such as plastic recycling
- Ask suppliers to transport goods and materials in reusable containers
- Increase raw material efficiency
- Measure all wastes
- Consult the waste hierarchy. It is much cheaper to avoid waste than to try to treat it.

## Energy

- Check all services
- Are pipes lagged to prevent heat loss?
- Are there any leaks in compressor lines?
- Look at replacing motors and pumps with variable speed impellers to reduce energy demand.
- Can some processes be used during off-peak times?
- Maintain all services thoroughly?
- Prevent fouling of boilers and cooling towers to increase efficiency and reduce wasted energy.
- Do not waste energy by producing waste products?
- Use heat exchangers where possible to capture energy lost in waste water or from wasted boiler steam.
- Turn energy using machinery and services off when they are not in use, especially over weekend periods?
- Negotiate energy contracts?

## Useful References

The following is a list of useful web sites.

Checkout the AiGroup websites for updates, additional information and invaluable resources.

**<http://www.aigroup.asn.au/>**

## Industry Specific Resource Material

This website contains workbooks, case studies and reference material for a range of different industry sectors, including the metals fabricating sector.

**<http://cleanerproduction.curtin.edu.au/cecp/industry/metal.htm>**

Envirowise, UK. This website contains workbooks, benchmarks and case studies for a range of different industry sectors.

**<http://www.envirowise.gov.uk/home.aspx?o=home>**

This website is a useful resource for the printing and packaging sector. It includes a sector specific workbook, checklists, benchmarks, best practice case studies and additional reference material.

**<http://www.printnet.com.au/pages/home/home.html>**

This website contains reference material including workbooks, benchmarks and case studies for different industry sectors, including the textiles sector.

**<http://www.p2pays.org/>**

This website includes a benchmarking program for the food processing sector.

**[http://www.business.vic.gov.au/BUSVIC.2752766/GAP//PC\\_GAP\\_59.html,svGAP\\_PC=PC\\_50731,contextPC=PC\\_50731,svgapkeep=Y,.CKB](http://www.business.vic.gov.au/BUSVIC.2752766/GAP//PC_GAP_59.html,svGAP_PC=PC_50731,contextPC=PC_50731,svgapkeep=Y,.CKB)**

## Government Websites

This is the general Victorian Government website which details assistance and funding initiatives for business and industry.

**<http://www.business.vic.gov.au/BUSVIC.2752766/LANDING//SEC06.html>**

This website contains case studies of cleaner production and industry best practice for a range of industry sectors.

**<http://www.deh.gov.au/settlements/industry/corporate/eecp/industry.html>**

This website is the home page of Sustainability Victoria, and includes case studies and assistance programs.

**<http://www.sustainability.vic.gov.au/www/html/1517-home-page.asp>**

This website is the home page of EPA Victoria and includes case studies and assistance programs.

**<http://www.epa.vic.gov.au/default.asp>**

This website includes a range of self help tools and case studies for small to medium sized business.

**<http://www.epa.nsw.gov.au/education/sustainbusinessresources.htm>**

## Water Conservation

Smart Water home page. Includes information on case studies, water savings initiatives in business and industry and funding available.

**<http://www.smartwater.com.au/mainf.asp>**

Victorian Water Trust home page. Includes information on water saving measures and funding programs.

**<http://www.dse.vic.gov.au/DSE/wcmn202.nsf/LinkView/F2FC43C535683C3FCA256FFE00091C20F8BDECC858787AFCCA257003001BFFE1>**

## Solid Waste

Wastepro. This website is a waste exchange database managed by the Victorian Waste Management Association. You may find ways to divert your waste from landfill, or even use someone's 'waste' in your production.

**<http://www.wasteexchange.net.au/index.asp>**