AUSTRALIAN ENVIRONMENT BUSINESS NETWORK

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A NEW GOVERNMENT INITIATIVE

Waste Reduction in the Printing Industry

Final Report

May 2003

EXECUTIVE SUMMARY

The Printing Industries Association in conjunction with the Australian Environment Business Network was successful in winning a $84,100 grant from the NSW Government's Waste Reduction Grants Program 2000-2001.

The objectives of the project are to:

- Identify what are effective waste minimisation printing practices
- Discover the waste management and environmental practices that are being conducted
- Analyze specific sites to identify effective waste management techniques tailored to Australian printers
- Disseminate these findings to the printing industry in NSW via a series of seminars and workshops

To fulfill these objects the Waste Reduction in the Printing Industry project was undertaken in 5 stages:

1. Literature review
2. Steering Group formation
3. Survey of printers
4. Site analysis of 6 printers
5. Seminar
6. Workshop

The literature survey identified a multitude of similar documents offering general advice on the large variety of printing processes used. While most of the information was generically useful, it was clear that to achieve real improvements in waste reduction and process efficiency requires management change. Resistance to changing old ways was identified as the main obstacle to improving waste management practices. To combat this benchmarking change management techniques and use of case studies were considered the main tool of use. As a result the seminars and workshops were geared to focus on encouraging a change in attitude using modern management practices.

Key findings from the survey included:

- 56% of respondents reporting they do not measure their wastes
- Variation across the industry in waste production and recycling is large
- The reported average spoilage rate 7.53% is considered as good as, if not better, than the rates published by the Printing Industries of America (PIA) ~10%.
- Average recycling rate [amount recycled to total waste including recycled and disposed] all respondents was 59%.

The on-site investigations of 6 printers of various sizes and printing processes produced some excellent case studies and insight into how well some printers were managing their environmental and waste reduction activities. In general the larger the printer the more reasons, economic and client based, they have by adopting environmentally friendly strategies. Some of the case studies found that substantial savings could be achieved. A major printer recently cut its paper wastage from 20+% down to 13% by the use of effective management techniques using a focus team approach.

The project steering group was a useful sounding board and source of information on the printing industry. As a consequence effective seminar and workshop modules were produced. The seminar and workshops were widely promoted at the Printing Industries annual conference and at the Digit Conference 2002. Nevertheless, gaining suitable numbers to attend the courses has been more difficult than envisioned. A series of six seminars and four workshops were planned, but to date four seminars and one workshop have been delivered. Printing industries will continue to run the seminars and workshops until at least the planed numbers have been met.

Feedback from the seminars and workshop has been encouraging with a high level of satisfaction and increased awareness being reported. In part, this project has produced the knock on effect with the Printing Industries commencing an annual benchmarking survey of its members to assist them in Australian printing industry comparisons, which will also include waste issues.

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1 INTRODUCTION

This report covers the outcomes of the Waste Management in the Printing Industries project, undertaken by the Printing Industries Association via a NSW Government grant of $81,400 from the NSW Government's Waste Reduction Grants Program 2000-2001, which is funded by the NSW Waste Planning and Management Fund and administered by the EPA.

The grant was allocated to assist the printing industry to improve its waste management performance and cut waste going to landfill. Spin off benefits such as saving money and cutting of resource usage are considered other key drivers for increased printing industry uptake of improved waste management performance.

There is a plethora of waste minimisation and cleaner production published information available for printers[1]. However, there is little that has been done to look at the implementation of published information and the impact this has had on waste production. Two such documents were of direct interest to this project which were assessed in the survey:

- Printing Industries Environment Management Manual, Printing Industries 1996
- Environment Information for Printers, EPA 1998

The survey found that 25.5% were aware of the EPA's publication and 23% had read Printing Industries Manual.

The purpose of the survey was to identify current waste management practices undertaken by the printing industry as well as other environmental issues. A key focus was on waste types, especially hazardous wastes. Moreover, Printing Industries wished to investigate the management drivers of printers, which take waste avoidance and minimisation more seriously than others. These management drivers and practices were shared across the industry through a series of seminars and workshops to encourage increased uptake of effective environmental practices and its spin-off effects which as improved productivity and saving from reduced waste. To investigate these drivers and the types of waste management activities and their spread across the industry a survey backed by on-site investigations of a selection of a range of printers—varying in size and printing process—was considered the best approach.

Use of benchmarking based on the type of printing process was widely used overseas, especially in the United States. Its use for waste reduction was seen a one advantage. It also became apparent that its use should be expanded as means to compare and incite some rivalry between printers on a range of efficiency measures. Overall benchmarking was seen as good for the printing industry and as a consequence, Printing Industries has commenced annual benchmarking surveys of all its members.

Uptake of waste reduction practices and accomplishments across the printing industry warranted further investigation, not only to understand what NSW printers are achieving, but also to pass on good practices to other printers. A focus on NSW printers is important due to NSW waste laws and their impact, which is not reflected in the literature available.

Once this information is gathered a dissemination process is required to pass it on to the printers. Hence a series of seminars and workshops were prepared and conducted to educate printers on what has been learnt.

There is anecdotal evidence that there has been reasonable uptake of good waste management practices in the printing industry, especially cutting paper wastage. However, other types of wastes, especially hazardous wastes could be better managed.

The project is divided into a number of stages including:

[1] See Literature review section chapter 2.

- Gathering of background information and literature review
- Forming a printing industry steering group to oversee and provide advice to the project
- Undertaking a survey on the waste management behaviour of the printing industry in NSW
- Analysing and preparation of a report on the survey results
- Undertaking an analysis of waste management practises at 6 printing sites
- Developing and conducting a series of seminars on good advice on waste management
- Developing and conducting a series of workshops to provide appropriate management tools in which to cut waste and improve efficiency for printers
- Develop a final report on the project

Each of the above activities undertaken as part of the project are discussed in this report. The bulk of the key findings of the project are contained in the workshop and seminars (Chapters 6 & 7) developed for this project. Consequently these educational packs form a main outcome of the project, which is to disseminate the knowledge and leanings gained to the printing industry so they may benefit.

1.1 The Printing Industry Association

The Printing Industries Association of Australia (*Printing Industries*) (formerly the Printing and Allied Trades Employers' Federation of Australia) is the peak representative organisation for companies in the print, packaging and visual communications industry.

The membership of the Printing Industries Association of Australia which comprises of more than 2000 companies is diverse and includes printers, desktop publishers, graphic designers, prepress houses, publishers, software and hardware manufacturers and distributors, paper and paper board manufacturers, paper merchants, ink manufacturers, manufacturers and suppliers of printing equipment and consumables, packaging and flexible packaging, paper converting, binding and finishing, communication and media services.

Printing Industries provides a comprehensive range of business assistance services as well as industry representation to all levels of government.

The industry, which Printing Industries represents, is very significant economically with a geographical presence in all regions of Australia. It employs more than 150,000 people, pays in excess of $5.6 billion in annual wages and salaries, has an annual turnover of more than $24 billion, exports some $1 billion annually, and undertakes annual investments in plant and equipment of more than $1.2 billion.

This project builds on the work done for four printing companies under the Department of State and Regional Development (DSRD) Cleaner Production Program. We also plan to investigate innovative approaches to waste minimization using a range of technologies and management processes.

1.2 Printing Industry Overview

The printing industry is a diverse industry printing on a wide range of substrates, such as paper, polymers, metals, etc., using a broad range of printing technologies. Large variations exist between printers in their waste management practices and amounts of waste they send to landfill.

For example, printers using siliconised papers for non-stick backings for labels find there is no recycling option for the siliconised paper off cuts. This is also the case for printers using carbon paper. Due to this diversity the printing industry is difficult to manage on an overall basis. Breaking

the industry down in to its main printing processes is typically where most generic waste management and cleaner production publications follow. However, there can be still large differences even within these categories.

The printing industry is divided into the main types of printing process, each with a different mix of waste types. A brief overview of the types of printing processes and typical wastes includes:

- **Pre-press Operations** – largely photographic processes are used for virtually all-large scale printing processes.

- *Wastes*: generating typical photographical wastes. (developer, fixer and wash waters) and empty containers. Digital prepress operations especially computer to plate technology has cut most of the photographic wastes from the process.

- **Lithographic Printing** – uses a metal plate, which is treated to attract or repel ink. Usually the ink is transferred via an intermediate rubber roller and is called the offset process. Lithographic process can use sheet-fed or web-fed paper, with web-fed paper supplied on a continuous roll.

  Wastes: Old plates, plate treatment wastes evaporated hydrocarbons and oils, waste inks, cleaning solutions and paper or substrate waste.

- **Gravure Printing** – uses a copper image carrier that has been either electro-mechanically or acid etched. High viscosity ink is transferred to the paper under pressure, followed by a ink dying process.

  Wastes: Old plates, waste acid, etching solutions, waste inks, cleaning solvents and evaporated solvents, usually hydrocarbons and paper or substrate waste.

- **Flexography Printing** – uses raised images on the printing plate to transfer images to paper. The printing plate is flexible, made of a rubber or an elastomer. Two techniques can be used to make the plates, one based on etching a metal master plate and casting the flexible plate, the other directly produces the flexible plate using photopolymers. The printing process is similar to lithographic where the inks are dried after application.

  Wastes: Old plates, residual materials generated by the flexible plate making process, cleaning solvents, waste inks evaporated solvents during the ink drying process and paper or substrate waste.

- **Letter press** – uses a flat metal or plastic plates with raised images to transfer ink to the paper. Ink is dried in a similar manner as with flexography printing.

  Wastes: Old plates and moulds, plate developer solutions, cleaning solutions, waste inks and paper waste.

- **Screen printing** – uses a stencil attached to a stretched porous polyester mesh. Ink is permitted to pass through the open areas in the stencil, on to the substrate material.

  Wastes: Old screens, screen and stencil wastes, waste inks, blockout, screen reclamation chemicals, paper or substrate wastes.

- **Photocopying** – Uses photographic or laser processes to impart a charge onto a sensitive drum which picks up a power toner (ink) and transfers this to paper. A fixer unit melts or bonds the toner to the paper.

  Wastes: Spent toner cartridges (some use wax blocks as toner, especially for colour photocopying), developer power (a magnetic ferrite material), waste paper.

- **Digital printing** – Uses laser processes to impart a charge onto a sensitive drum, which picks up a special ink and transfers this to paper. The process is similar to photocopying but can use different inks and toners and at a much larger scale.

  Wastes: Spent inks or toner cartridges, developer power (a magnetic ferrite material), waste paper and redundant computer and IT equipment.

- **Post printing processes** – Binding and collating operations use stapling, glues, threads, laminating, cutting, scoring, creasing, special shaping.

  Wastes: paper or substrate off cuts, glues, binding materials, redundant stock.

1.3 Flow Chart of a Typical Printer

The flow of materials and work through a printer is remarkably similar, the main difference being the type of printing operation being undertaken. So the main printing processes listed above can be substituted in the printing operations box with the other issues remaining virtually unchanged.

A typical printer has the following process flow chart:

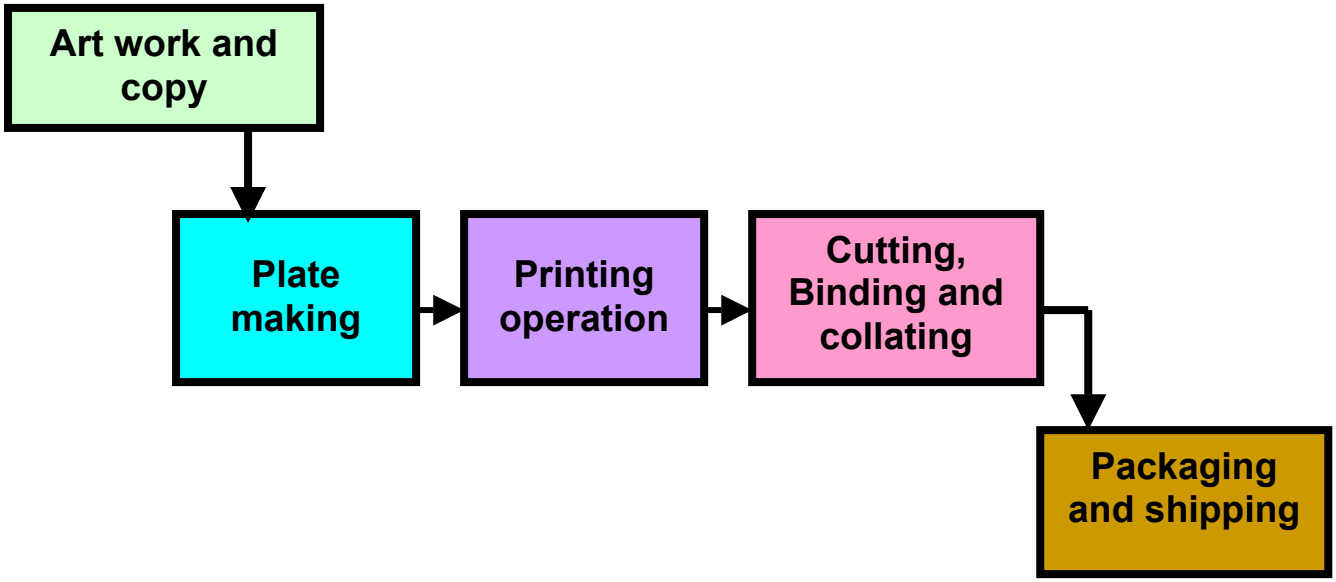


Figure 1 Process Flowchart of a Typical Printer

Not all printers follow this process flow chart as many have plate making or photographic processing undertaken off-site by an other company or part of the printing site's company. Many graphic houses produce bromides (the photographic film used to make plates) and export them for printing overseas. Each of these processes use raw materials and produces wastes. So each section hold a potential for waste minimisation.

1.4 Commercial Pressures

Printers are faced with considerable commercial pressure from each other, as there is a large amount of printing equipment turnover, accelerated by the technology improvement brought about by computer and IT technologies. As a consequence start up printers are able to purchase second hand equipment at relatively low prices. In addition, with the ease of transmission of electronic files overseas printers offer their services at considerably lower prices than do local printers. However, overseas printers, while up to one third the price for a similar job, do not offer the same customer relationship, proof reading abilities—English is not generally their first language—and speed of delivery as the finished product is usually shipped.

A number of overseas publications, such as topical magazines and journals where time is important, send the bromides or appropriate computer files to an Australian based printer to ensure the publication is distributed in as little time after it has been released overseas.

Overall the commercial pressures faced by printers have had the industry facing a slowly shrinking market. Any means to reduce costs and win over new customers is attractive to printers.

1.5 Why Minimise Waste?

Australian printers are under considerable market pressure and need to lift their game, especially over overseas competition. Increasing landfill prices, regulatory pressures and customer awareness are signals that things could get worse from a cost of production perspective. A smart printer may find that by jumping ahead and using advance waste minimisation methods can give a commercial advantage.

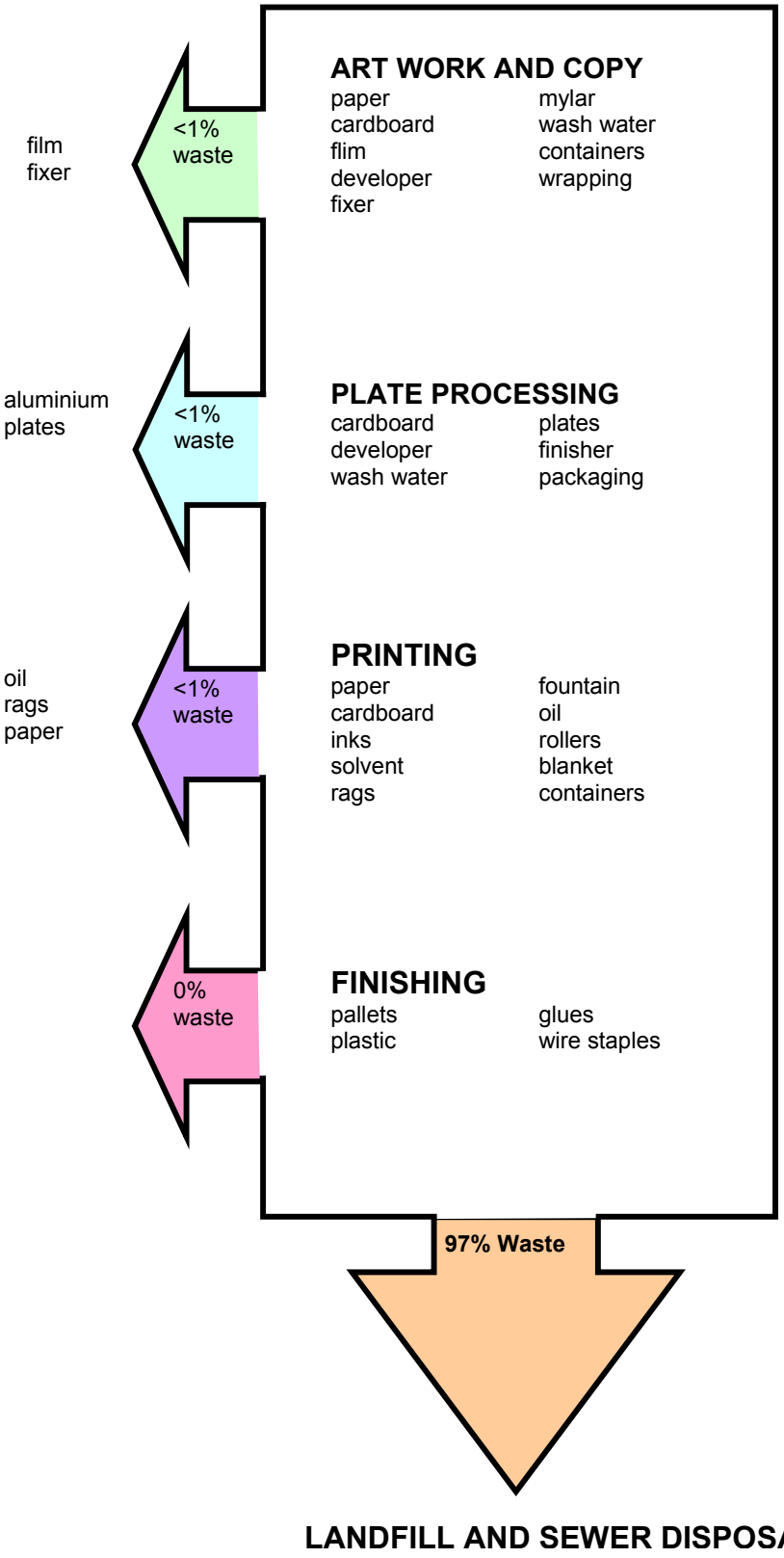
Waste minimisation assists in reducing commercial pressures by:

- Cutting costs largely due to the savings from diverting wastes from landfill disposal to recycling.
- Lifting the environmental image of the company and therefore attracting new environmentally sensitive customers
- Improving staff moral, therefore productivity—we do more than just make money for the company and it shareholders, we also look after the environment.
- Reducing regulatory pressures on the individual company and on the industry as a whole
- Improving public perception of the printing industry as one of green and clean

Most of the market leaders in waste and environmental management in the printing industry are at the larger end of the market. Larger companies have more resources to invest in identifying and implementing efficiency gains. The printing industry is no different from many other industry sectors, with a sharp difference between waste management practices of large and small printers.

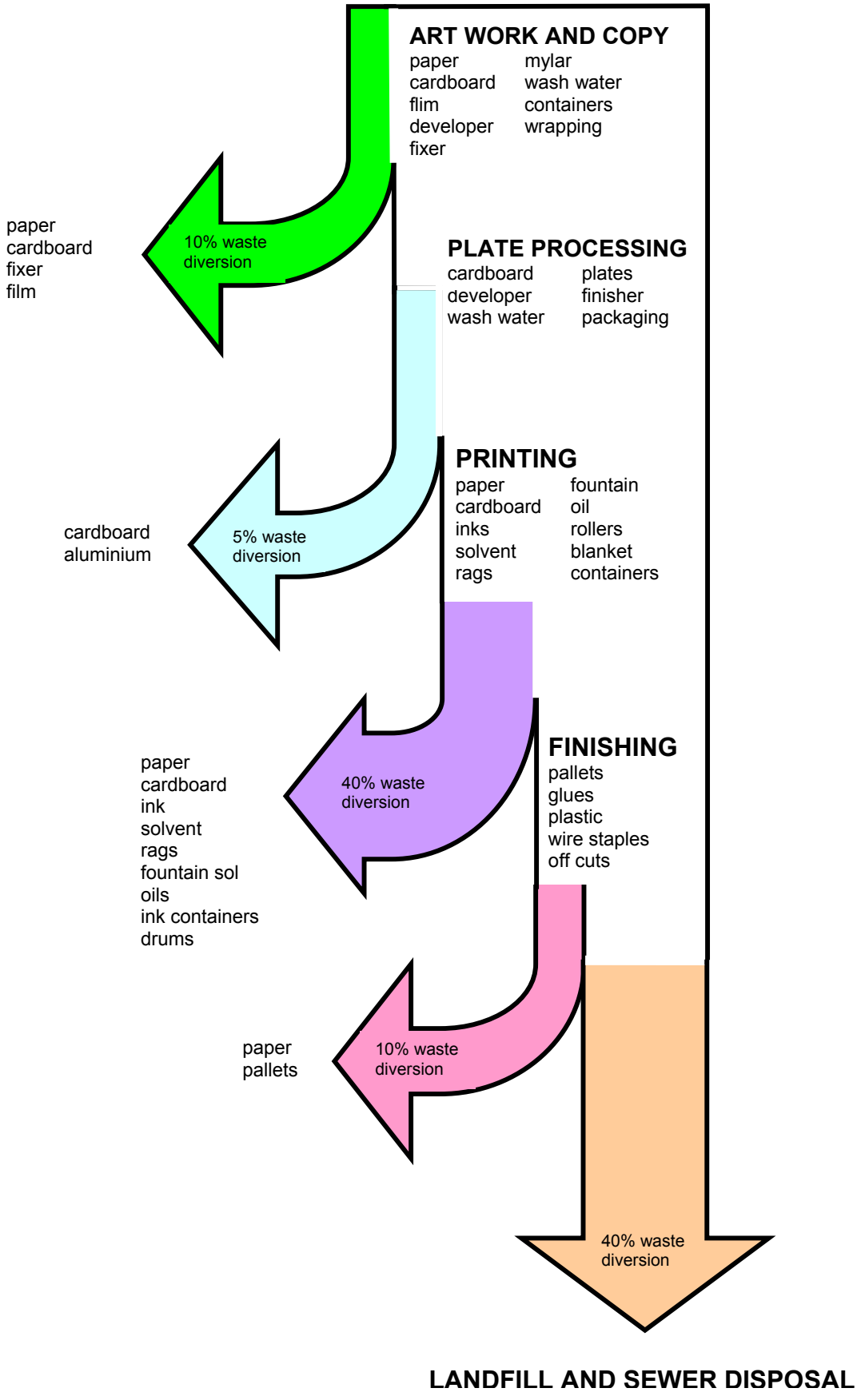
Figures 2 and 3 show the differences between an efficient and wasteful printer. An efficient printer actions waste management and minimisation principals at every step of the printing process. Many printers are between these two extremes. For example, many printers recycle large quantities of recoverable paper from the printing operation, but ignore the wastes from the other processes

Figure 2 A Wasteful Printer's Profile



.

Figure 3 A Efficient Printer's Waste Profile



2 LITERATURE SURVEY

1.1 Overview

The Printing Industries Association of Australia on behalf of the NSW Government is undertaking the Waste Reduction in the Printing Industry project. In commencing the project a literature review has been undertaken to identify similar and related work.

Overall the literature contains a plethora of assistance and guidance documents, mainly from government agencies across North America and Europe. Literature sources directly from the printing industry, although lesser in number, offer a different approach to waste minimisation. Common to the competitive printing industry is the lack of management skills necessary to cut waste and increase efficiency. While the government documentations focus on environmental outcomes, especially reduction of waste to landfill, the industry documentations focus on a broader all encompassing definition of waste; waste being waste of time, waste of resources or other poor communications between sections in a company. Clearly good management practices are completely compatible with good waste minimisation actions.

Perhaps the most valuable information source is from the American Printing Association, which undertakes regular surveys of members performances including waste generation, specifically spoilage ratios. A copy of the latest edition of this reference is on order and should arrive in a few weeks. Data on waste generation or benchmarking information is not widely available from web sources, generally accessible at a price.

1.2 Excerpts From The Literature Survey

Some relevant information from the literature survey includes:

- Waste spoilage generation rates are anywhere from <1% to 25% with 12% an average. However, the spoilage rate depends on the size of the job. Smaller jobs will have much larger spoilage rates due to the set up processes to get the printing right takes about the same regardless of job size. It is common for printers to charge for a percentage of waste and spoilage in quotes and costs. Consequently, for most printers cutting waste spoilage means higher profits.

- The US EPA Toxic Release Inventory reports 63% non-compliance rate from printers, with 11% resulting in enforcement. This is largely due to hazardous waste issues. Similar issues on hazardous waste are expected to occur in NSW. Note that while a 63% non-compliance sounds high it is no where other near poorer performing industry sectors. Hazardous waste is a significant issue for printers.

- The American Printing Association publishes economic information bulletins on printing industry outlooks and survey results. It rated of environmental issues, including to improve efficiency and to cut waste 4th [6.4%] as the most important issue after:Cutting costs [46.8%] Generate new revenue [33.9%] Freeze CAPX [6.9%]**1.3 Websites**

There are about 3 specific websites designed for printers to improve their environmental performance. Some act as portals to other relevant sites. The Enviroene site, part of the US EPA site, accesses data information to solvent types, properties and manufacturers. The survey focused on specific issues to printing processes rather than information on recycled papers and their science, which is related but indirect to this project.

The Printers National Environmental Assistance Center is perhaps the most directed site to printing processes and contains a wealth of information and reference material. Close behind was the Printers National Environmental Assistance Center followed by the US EPA website and its related connections such as P2P.

1.4 Reference Tables

Attached is the summary form containing the references for the project. Each reference is categorized into its application for

- Waste Data
- Case Study
- Waste Reduction Information
- Hazardous Waste Reduction Information
- Waste Auditing
- Environmental Management
- Printing type which covers:
    - [a] = all
    - [f] = flexographic
    - [g] =gravure
    - [s] = screen printing
    - [l] = lithographic
    - [p] = letter press
    - [g] = generic
    - [r] = regulatory
    - [w] = web

Waste Reduction in the Printing Industry
Summary of Literature and Websites

Reference Type							Reference
Waste Data	Case Study	Waste Reduction Information	Hazardous Waste Reduction Information	Waste Auditing	Environmental Management	Printing type *	Keys: Printing Type: [a] = all [r] =regulatory [f] = flexographic [w] = web [g] =gravure [s] = screen printing [l] = lithographic [p] = letter press [g] = generic
		1	1			a	Alternatives to Petroleum- and Solvent-Based Inks, The Massachusetts Toxics Use Reduction Institute, University of Massachusetts Lowell, One University Avenue, Lowell, MA, 01854. June 1994.
			1	1		l	An Evaluation of Substitute Blanket Washes, US EPA Solutions for Lithographic Printers, 744-F-96-009, 30 pages
1	1	1		1	1	a	Anzpac Services Australia, National Packaging Covenant Action Plan
		1	1			r	Business Waste Reduction: Creating an Action Plan, MERRA and Resource Recycling Systems, Inc. for the Environmental Services Division, August 1993. 1-800-662-9278.
	1		1	1	1	a	Case Studies from the Pollution Prevention Information Clearinghouse, U.S. Environmental Protection Agency, Office of Environmental Engineering and Technology Demonstration and the Office of Pollution Prevention, November 1989. (202) 260-1023.
		1				a	Commercial Printing and Pollution Prevention, Pollution Prevention Bulletin, vol. 3, no., Spring 1994, p. 3.
		1		1		l	Cleaner Production Strategies For Lithographic Printers Waitakere Council New Zealand
	1		1	1		t	Costing and Financial Analysis of Pollution Prevention Projects: A Training Packet: Workshop Agenda Workshop Curriculum Case Studies and Report, 1992.
	1		1	1		a	Design for the Environment Printing Project - Case Study 1: Managing Solvent and Wipes, U.S. Environmental Protection Agency, 744-K-93-001, March 1993. (202) 260-1023. Development of a Pollution Prevention Factors Methodology Based on Life-Cycle Assessment: Lithographic Printing Case Study, Risk Reduction Engineering Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH, 45268. EPA/600/R-94/157. January 1994.
	1			1	1	a	Environmental Benchmarking: Best Demonstrated Practices, Washington, D.C., October 16-17, 1995 -- New York, NY: Executive Enterprises, 1995. 658.408.E61
		1		1	1	a	Environmental best practices in the forest cluster, *Sten Nilsson,* Sustainable Boreal Forest Resources Project March 17, 1999 International Institute for Applied Systems Analysis Schlossplatz 1 • A-2361 Laxenburg • Austria
		1	1		1	g	Environmental Information for Printers, EPA 1998 ISBN 07313 0927
	1		1		1	a	Environmental Management and Pollution Prevention: A Guide for Photo Processors, Washington State Department of Ecology.
			1	1	1	s	Environmental Management and Pollution Prevention: A Guide for Screen Printers, Washington State Department of Ecology, September 1994, Publication 94-137.

Waste Data	Case Study	Waste Reduction Information	Hazardous Waste Reduction Information	Waste Auditing	Environmental Management	Printing type *	Keys: Printing Type: [a] = all [g] = generic [f] = flexographic [g] =gravure [s] = screen printing [l] = lithographic [p] = letter press [r] =regulatory [w] = web
	1				1	f	Environmental Research Brief: Waste Minimization Assessment for a Manufacturer of Plastic Bags, F. William Kirsch and Gwen P. Looby, U.S. EPA Risk Reduction Engineering Laboratory, Cincinnati, OH. 45260, EPA/600/M-90/017, December 1990, (202) 260-1023.
1					1	a	EPA Office of Compliance Sector Notebook Project, Profile of the Printing and Publishing Industry, August 1995 Office of Compliance, Office of Enforcement and Compliance Assurance. U.S. Environmental Protection Agency
		1	1	1	1	a	EPA Office of Compliance Sector Notebook Project, Profile of the Printing and Publishing Industry, Massachusetts Department of Environmental Protection
	1	1	1			o	Environmental Research Brief: Waste Minimization Assessment for a Manufacturer of Printed Labels, F. William Kirsch and J. Clifford Maginn, U.S. EPA Risk Reduction Engineering Laboratory, Cincinnati, OH. 45260, EPA/600/M-91/047, October 1991, (202) 260-1023.
		1	1	1	1	a	Guides to Pollution Prevention: The Commercial Printing Industry, Risk Reduction Engineering Laboratory and Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH, 45268. EPA-625/7-90/008, August 1990.
1	1	1	1			g	Integrating P2 into the Inspection Process, *Kansas SBEAP June 2001*
1			1			r	Industrial Pollution Control (Ni) Order 1997, Guidance For Processes Prescribed For Air Pollution Control By District Councils, UK
		1	1	1		r	Multimedia Compliance/Pollution Prevention, Assessment Checklist For Screen Printing Facilities, USEPA
1						g	Pollution Abatement Costs and Expenditures: 1994 U.S. Department of Commerce, Economics and Statistics Administration Bureau Of The Census
		1	1	1		a	Printing Industries Environmental Reference Management Manual (PIAA) [August 1996]
		1	1	1	1	l	Pollution Prevention Checklist and Strategies for the Lithographic Printing Industry, Michigan Great Printers Project, 1996.
	1		1	1		f	Project Summary: Ink and Cleaner Waste Reduction Evaluation for Flexographic Printers, U.S. Environmental Protection, Agency, Center for Environmental Research Information, Cincinnati, OH, 45268, EPA/600/SR-93/086. July 1993. (202), 260-1023.
1	1		1	1	1	a	Profile of the Printing Industry; EPA Office of Compliance Sector Notebook Project, Office of Compliance, Office of Enforcement and Compliance Assurance, U.S. Environmental Protection Agency, 401 M Street, SW (MC 2221-A), Washington, DC, 20460, EPA/310-R-95-014. August 1995. (202) 260-1023.
1	1		1		1	a	Process Benchmarking, Peter Doyle, Action Printing, Fond du Lac, WI, Seminar in PowerPoint
1	1		1		1	a	Process Benchmarking Peter Doyle, Action Printing, Fond du Lac, WI, R&E Progress In The Pressroom Seminar in PowerPoint
		1		1	1	a	Recycling Of Printed Products, What can the printing industry do to make it easier? The environmental council of the Swedish printing industries

Waste Data	Case Study	Waste Reduction Information	Hazardous Waste Reduction Information	Waste Auditing	Environmental Management	Printing type *	Keys: Printing Type: [a] = all [p] = letter press [g] = generic [r] =regulatory [f] = flexographic [w] = web [g] =gravure [s] = screen printing [l] = lithographic
		1				g	The Economic outlook for Printing, NAPL Economic Research Centre, May 2001
	1		1		1	l	Understanding Hazardous Waste Generation and Responsibilities: An Introductory Guide for Lithographic Printers, Michigan, Great Printers Project, 1996.
							Waste Minimization Manual, Printing and Publishing Industry, Alberta Environmental Protection.
							Profiting From Cleaner Production: Towards Efficient Resource Management, United Nations Environment Program, 2002
1			1	1		a	US EPA Industry Generation of Waste – Printing section 5.10

Website References:

Website references contain vast sources of information and further reference materials.

Waste Data	Case Study	Waste Reduction Information	Hazardous Waste Reduction Information	Waste Auditing	Environmental Management	Printing type *	Keys: Printing Type: [a] = all [f] = flexographic [g] =gravure [s] = screen printing [l] = lithographic [p] = letter press [g] = generic [r] =regulatory [w] = web
1	1	1	1	1	1	a	http://www.pneac.org Printers National Environmental Assistance Center
1	1	1	1	1	1	a	http://www.pprc.org/pprc Printers National Environmental Assistance Center
		1	1	1	1	a	http://www.gain.com/ Graphical Arts Technical Foundation & Printing Industries of America – Runs annual ratios for a fee for the US printing industry. Purchase of waste ratios is underway
		1	1		1	s	http://www.usscreen.com U.S. Screen Printing Institute
		1	1	1	1	a	http://es.epa.gov Enviroene USEPA reference portal for various industrial substances, e.g. solvents and their properties
			1			a	http://solvdb.ncms.org Solvents database from the National Center for Manufacturing Sciences
	1	1	1	1	1	a	http://www3.ec.gc.ca/CPPIC/Search/English/Advanced_E.htm Canadian Pollution Prevention Information Clearinghouse
		1				a	http://www.ppic.org.uk The paper industry website by the Paper Federation of Great Britain

3 STEERING GROUP

3.1 Purpose

An invaluable part of the project was the Project Steering Group. Members of the Steering group were invited from Australia's leading printers, most were fully responsible for environmental issues for their company operations across Australia, even internationally. The level of expertise and knowledge of what works and does not work in the printing industry substantially added to the quality of this project.

In addition to overseeing the progress of the project, the Steering Group provided valuable information and guidance on the printing industry and detailed technical issues.

The Steering Group formally met on 6 May 1 July and 2 September 2002. It also provided comments and feed back through the development of the Seminar and Workshop Training packages. Each meeting was held in a formal basis with each members provided with an agenda. The consultant usually presented the issues for discussion in a formal presentation supported by a PowerPoint presentation.

3.2 List of Steering Committee Members

- Heather Campbell, General Manager Workplace Risk Manager Amcor
- John Corrigan, Compliance Manager, Link Printing
- Dr Tony Wilkins, Environment Manager, News Ltd
- Sandra Cowell, Occupational Health, Safety and Environment Manager, PMP Ltd
- Darren Jensen, NSW Manager, Printing Industries Association
- Andrew Doig, Director, Australian Environment Business Network

4 SURVEY AND RESULTS

4.1 Outline

The purpose of the survey was to obtain information on current waste management and environmental activities. It also enquired as to the primary drivers for adopting waste and environmentally friendly printing practices. Information gathered was then used to structure the seminar and workshop training packages. It was also used to sharpen the issues and data to be sought from the analysis of the individual companies undertaken in the next stage of the project.

A number of drafts of the survey were completed and circulated to the Project Steering Group for their comments. A number of modifications were made to simplify and shorten the survey form following advice from the steering group. For example, the Steering Group stressed that a the statement that '*Information supplied will be treated as confidential and only summary data will be released*' be used on the survey as competitive pressures may reduce the response rate.

Once the survey was finalised and approved by the Steering Group the process of distribution and promotion of the survey was undertaken. Distribution and promotional activities included:

- Printing Industries distributed survey form to their members.
- A copy of the survey form and supporting information sheet was posted on the Printnet and AEBN websites.

Supporting the survey form was an information sheet detailing the definitions terms and what information each question were asking for. While many terms are used across the printing industry their meaning can vary from site to site. One example of this is the term for spoilage. Some portion of spoilage the customer may pay for, consequently this may not be considered as spoilage at some sites. Virtually all spoilage, regardless of who pays for it, is measured by the number of sheets, which do not count as final product. Spoilage can also be confused with make ready waste; the waste generated to align the colours and paper.

4.2 Benchmarking Information

A major comparison reference to the results of the survey is the United States Printing Industry Association's (US PIA) Benchmarking reports. The US PIA undertakes annual survey of its members to collate and compare performances against each other. A range of efficiency measures including spoilage are used for benchmarking. Overall NSW printers performed better than their US counterparts in terms of spoilage. Nevertheless, the data gained from both the survey and the US PIA show the large variations that occur across the printing industry.

One result from undertaking the survey and comparing it to the US PIA data has been the adoption of an annual benchmarking survey by the Printing Industries Association. Consequently some of the data obtained from this project's survey will continue to be collected.

4.3 The Survey and Report

Appendix 1: A detailed report was provided to the EPA on the results of the survey.
Appendix 2: Survey Of The Printing Industry On Its Environmental And Waste Issues
Appendix 3: Information Sheet Supporting The Printing Industry Short Waste Survey

4.4 Main Findings

In May and June 2002 the Printing Industries Association undertook the survey titled *Survey of the Printing Industry on its Environmental and Waste Issues.* 75 printers, employing 4,723 completed the Survey. Given that approximately 48,000 are employed in the printing industry across NSW the survey represents just under 10% of NSW's printing industry.

The key findings of the survey were:

- There is a wide margin between printers in their attention to waste management and environmental issues. This is best described by 56% of respondents reporting they do not measure their wastes[2].

- Variation across the industry in waste production and recycling is large and a function of the printing medium being used, types of printing process and the job run lengths each printer receives from their clients.

- The reported spoilage rate[3] [the main source of waste, usually recycled] is considered as good as, if not better, than the rates published by the Printing Industries of America (PIA). The range for sheet fed was from 1% to 17.5%, which is comparable with the PIA data. The average spoilage rate was 7.53% varying from < 1% to as high as 25%. 94% of respondents reported an average spoilage rate.

- Average recycling rate [amount recycled to total waste including recycled and disposed] all respondents was 59%. This only increased to 69% when looking at the printers that also measure their wastes. However, 9% reported they did not recycle at all, but this is in part due to the printing medium used or product, such as carbon paper, which cannot be recycled. Use of recycled paper has a bipolar approach by the industry. A few large printers will use nothing else. Many sheet fed printers rarely use recycled stock, largely driven by clients choices, but also by problems with cost and quality of recycled paper.

- Hazardous wastes fell into five categories, solvents 31%, inks 13%, rags 8%, oils 24% and photographic chemicals 13% of the total quantity of hazardous waste generated. 15% of printers appeared to exceed the 10 tpa threshold warranting a waste activity licence from the EPA.

Key areas requiring additional investigation in the detailed analysis:

- The methods used to measure wastes, especially relating spoilage amounts to waste and amounts destined for recycling and disposal require further analysis.

- Post printing activities such as laminating, cutting, wrapping and packaging of the printed product are potential areas for investigation in respect to waste generation rates and where they can be minimised.

- Generation of hazardous waste is the most problematic for printers. How such wastes are generated and managed needs further investigation.

- Identify good waste avoidance practices for preparation into case studies.

Key actions for information provision to printers:

- Identify the need to measure wastes; for cost saving and environmental benefit reasons

- Provide a range of standard but practical methods to measure wastes

- How to avoid and better manage print medium waste, post printing wastes

- How to better manage hazardous waste; its legal requirements, avoidance, generation, management, recycling and disposal

- Provide case studies on effective waste management / cost management issues

[2] Measurement of spoilage was not considered in this instance as a measure of waste.

[3] Spoilage rates are generally easily measured as printing machines record the printed number of sheets, pages or units. Hence spoilage can be accurately determined by the simple recording of number printed and number spoiled.

5 ANALYSIS OF PRINTING COMPANIES

To supplement the information gained from the survey on printing companies, 6 analyses of a selection of printing company sites was undertaken. Agreement from each company was received prior to the site visit.

List of companies visited:

- Anzpac
- Kwik Kopy Printing West Ryde
- Permanent Press
- PMP
- Websdale Printing
- Amcor Flexible Packaging

Key issues identified by the detailed on-site analysis of chosen companies includes:

- Large variation between printers in their attention to waste management issues, which reflects the surveys' results.
- Weighting of wastes is an uncommon practice. Visual breakdowns and volume measurements are the most common measurement practice by printers that undertake measurement activities. While not as accurate as weighing it is an easy starting point and has lead to major savings.
- Use of spoilage by printers to measure wastes only gives part of the overall waste generation of a site. Packaging from supplies is a key waste source.
- Recycling is extensively used for printed medium and some other waste types, but better segregation of waste to landfill and recyclable wastes is an area for improvement.
- Major costs savings have been achieved by focusing on waste minimisation at source, especially with the larger printers. Team efforts, which have focused on efficiency and cutting waste, achieved some of the best results.
- Use of latest digital computer to plate technologies have hidden benefits such as cutting water, film and photographic chemicals use.
- Three of the sites visited were good performers, even leaders in waste management and have provided good case studies for the workshop.

Overall what separated the best performance leaders were good management practices. Without senior management support and commitment down the management chain waste management becomes a token issue, rather than one, which demands appropriate resources and attention.

The following briefs outline each of the above companies and their waste generation and management strategies.

5.1 Anzpac

Background

A large gravure printing company making high tolerance packaging mainly for the tobacco industry.

They operate:

- 2 web fed gravure 8 colour presses with embossing and cutting operations
- 40" lithographic press
- Laminator
- Gluing line

Waste Generation:

Employment: 190 Consumption 14,000 tonnes pa
Total Waste generation: 1,380 tonnes pa

Recycled	1,160 tpa	(84.2%)
Landfilled wastes	160 tpa	(11.7%)
Hazardous wastes	57 tpa	(4.1%)

Waste types: to landfill

Paper, foil on paper, wood waste, construction wastes (installing new press), cardboard, plastic buckets, ink cans, scrap steel, floor sweepings, siliconised paper, food wastes, bathroom wastes, plastic wastes, gloves, plastic binding straps.

Hazardous wastes disposed :

Solvents, solvent based inks, water based inks, glues, electroplating wastes, rags and wipes

Waste types recycled:

Paper inked, white paper, cardboard, steel, copper swarf, aluminium, shrink wrap, cores, forklift batteries (by contractor), solvents and some inks

Waste Management:

Anzpac is one of the few sites that weigh their wastes. They work to a percentage yield of paper in vs paper out that is paid for, which is currently ~91%. Their target is 8.5% spoilage, which is ambitious given the 10 step printing, creasing and cutting operation that their presses operate under. Spoilage on some jobs can go to 20%. Systems are in place to ensure continuous improvement in efficiency.

Results of the performance of the company in terms of efficiency (%yield) and many other factors are displayed on notice boards. They work closely with their waste contractor who also takes many types of materials for recycling such as shrink-wrap. The contractor also provides weighbridge dockets for waste sent to landfill and recycling facilities. The data from which is feed into their management system.

The gravure process is dependent on highly volatile solvents, most of which are flammable class 3 dangerous goods. This generates wash down solvent wastes, which are usually recycled. Some waste solvents end up mixed with inks and other liquids making disposal the only route.

The high tolerances required by their clients means they are limited to using maximum 15% post consumer recycled stock board for printing.

Anzpac has a good internal benchmarking system. It is common to see various performance measurement charts on key notice boards around the factory area. There is little mistaking when production has performed well and when it has not.

Overall Anzpac has a well run waste management system. Nevertheless, other printers have undertaken additional steps to reducing wastes that may be adaptable here.

5.2 Kwik Kopy Printing West Ryde

Background

The smallest printer participating in the detailed analysis project.

They operate:

- Lithographic single colour
- Photographic section and plate making
- Colour and black and white photocopying
- Numbering and perforating unit (single sheet)

Waste Generation:

Employment: 4 (max) consumption 4 tonnes pa paper
Total Waste generation: 11 m^3 pa
Recycled 7.7 m^3 pa (70%)
Landfilled wastes 3.3 m^3 pa (30%)
Hazardous wastes 350 litres pa

Waste types: to landfill

cardboard, some paper, ink cans, floor sweepings, siliconised paper, food wastes, bathroom wastes, plastic wastes, rags and wipes, plastic binding straps (packaging waste from supplies

Hazardous wastes disposed :

Solvents, water based inks,

Waste types recycled:

Paper inked, cardboard, photographic wastes, in-house recycling of special ink colours

Waste Management

While being a small printing shop, KwikKopy practices a number of effective waste minimisation techniques such as:

Reusing make ready waste. With a manual lithographic printer they require about 80–100 pages to set up. KwikKopy simply reuses the old make ready paper on the other side for the next make ready set up process.

Storing colours: Using a single colour press means that inks must be blended to suit each client. KwikKopy keeps left over inks for the next time that client.

Waste is not measured except by bin size. Recycle 240 litre bin is collected weekly. Spoilage is closely watched and he achieves 3% rate while the standard charged spoilage rate is 8%.

KwikKopy franchise company takes note of the performance of each of its sites and provides information to its branches on how to cut costs and be more environmentally friendly.

The single colour lithographic printer resides next to its ink supplies. The printer was careful to store blended colours of inks from various clients. Being a single colour printer, individual colours have to be made up. This is in contrast to 4 colour printing machines, which can generate any colour from the basic 4.

Storage of solvents is an issue for any printer. Here approximately 30 litres of class 3 solvent was stored. If larger quantities are stored they can trigger the licensing limit for dangerous goods. Flammable solvents are commonly used to clean the blankets in lithographic printing presses.

This close up of the printing press shows the counter, which is universal on all presses, except antique ones.
The counter is the means in which most printers measure spoilage.

5.3 Permanent Press

Background

A small lithographic printing company.

They operate:

- 2 lithographic press
- Letter set press used for embossing
- Cutting
- Photographic section and plate making

Waste Generation:

Employment: 11 Consumption 50 tonnes pa
Total Waste generation: 456 m^3
Recycled 450 m^3 pa (97.5%)
Landfilled wastes 4 m^3 pa (2%)
Hazardous wastes 2,400 litres pa (0.5%)

Waste types: to landfill

Paper, cardboard, ink cans, photographic films, floor sweepings, food wastes, plastic wastes, plastic binding straps rags and wipes, polymer plates, oil absorbent socks

Hazardous wastes disposed :

Solvents

Waste types recycled:

Paper, cardboard, solvents, some inks and photographic wastes

Waste Management

Permanent Press relies on the skills of their printers to ensure high efficiency and low spoilage rates. As they do not measure their wastes, Permanent Press waste management is based on operators' memories to achieve a reasonable or tolerable level of waste generation. While this may seem to be poor practice, there are at most 4 printers on the floor. Each machine has its own landfill bin with 4 in total, which are emptied about one per week. In effect this give Permanent Press a very low landfill waste amount for their size. House keeping receives good attention and leads to the low waste results.

With four colour lithographic presses Permanent Press sets a goal of 500 sheets for make ready—digital set up machines can do this with as low as 50 sheets. As the lithographic process can move colours during the printing process (unlike the gravure process) some errors can occur during a longer print run which leads to more spoilage.

Most solvent waste, rags and wipes are generated during the blanket wash phase and the cleaning of rollers and plate changes at the end of each job.

Permanent Press cut many errors by keeping a detailed database of client's jobs, films and specifications. Returning to this historical data they can cut many typical errors that can plague a printing shop.

Permanent Press use a manual blanket wash system, which while slower than automatic systems it is claimed to use less solvent if properly undertaken.

Permanent Press's four colour press undergoing a mid run blanket wash of the plates, rollers and blanket.

The pre-press process of a lithographic printing process will usually use one these plate development machines.

Here the bromide is placed in contact with the lithographic plate. A UV lamp is turned on which burns the photoresist from the plate. The plate is then washed and placed on the press for printing.

The whole process of making the bromide and its development is eliminated with computer to plate technology.

Waste segregation at Permanent Press. This basket is for collected paper for recycling.

5.4 PMP

Background

A large lithographic printing company making magazines.

They operate

- 4 web fed lithographic 4 colour presses with embossing and cutting operations
- 1 Sheet fed lithographic press
- Full collating and binding line
- In line cutting
- Pressure fed ink lines

Waste Generation

Employment: 500 Consumption 50,000 tonnes pa

Total Waste generation:	10,757 tonnes pa	
Recycled	9,400 tpa	(87%)
Landfilled wastes	1,200 tpa	(11%)
Hazardous wastes	157 tpa	(1.4%)

Waste types: to landfill

Paper (56%), cardboard (14%), wood waste (11%), plastic (8.6%), rags and wipes (6.2%), scrap steel, floor sweepings, siliconised paper, food wastes, bathroom wastes, gloves, plastic binding straps, shrink wrap.

Hazardous wastes disposed

Solvents, Solvents and inks mixtures (energy recovery)

Waste types recycled

Paper inked, white paper, cardboard, aluminium, cores, forklift batteries (by contractor), solvents and some inks

Waste Management

PMP is the largest magazine printer in Australia and this is one of their larger sites. They recently employed a project engineer who has been given environment and efficiency responsibility and is implementing ISO 14001. He has undertaken a complete waste audit on the site. Major savings have resulted from closely looking at their wastes.

A focus team on the press area has cut waste considerably by introducing cleaner production and waste minimisation techniques into the process. From the press area they claim to have cut waste from 13% to 7% largely by attention to spoilage. This has resulted in savings on this part of the process alone of over $5 million if similar practices are introduced across PMP's other 13 sites. (see case study)

Further work to cut waste paper are continuing, especially reduction of paper waste to landfill where the use of colour coded bins should progress waste segregation sending more to recycling. Improvements can still be made to cut wastage at the binding and shipping areas. Down stream efficiency improvements will lead to further savings such as less over printing, a standard practice to cover downstream errors. Close attention to suppliers and improving and standardising supplies will lead to further waste cuts.

Most waste is measured in volume i.e. cubic meters rather than being weighed. Even using this simple and often visual breakdown of mixed wastes, considerable data has been obtained to assist in analysing the waste stream. Weighing of waste streams are to be introduced across the waste

streams, although much of that data comes from the waste contractors and their supply of weighbridge dockets.

Other innovations have been the change over to computer to plate process. This change over to the new digital technology cuts out the step of making contact film for plate making. As a consequence cuts out all film, photographic and wash water wastes. Water and sewer charges were cut by about 50% by the change over to this technology. (see case study)

Overall PMP has made substantial savings by focusing on waste. If transferred to their other sites across Australia many millions of dollars will be saved.

PMP uses perhaps some of the largest full colour presses in Australia

The binding operations tend to be the neglected end in process efficiency. Part of the reason for this is the large variation in binding work and high turnover of casual staff.

Case Study – Focus Team Cuts Paper Wastage

To cut the amount of paper wastage PMP management organised a focus team to identify actions that resulted in paper waste, then to find ways to cost effectively change production procedures to cut this wastage. A 4 person team was established by management to cut paper wastage. At PMP's Moorebank site paper waste was cut from 20% to 13%. If this efficiency gain could be achieved over PMP's 14 sites almost $7 million could be cut from the annual paper and waste bills. Numerous waste reduction strategies were introduced which included:

- Running the web rolls to their minimum diameter—some paper is always left on the web roll to prevent the likelihood of tearing which increases substantially as the roll gets closer to the core.
- Make ready waste reduction strategies—many newer presses provide operators with a lot of information from the advances in computerised control systems. However, much of this data is not used. The PMP team used this information and were able to identify areas for improvement to cut make ready waste considerably.
- Web breaks are a major source of waste on web-based presses. The team used the data from the press and other means to identify the main reasons for web-breaks. If the break was due to inconsistent paper strength, PMP went back to their suppliers to provide them with quality assurance feedback.
- Improving machine tolerances or blueprinting made substantial differences to reducing web-breaks, which were not paper quality dependent. Higher tolerances meant more consistent performance from the presses and lower paper wastage.

Cores from PMP stored for recycling as high-grade (non-inked) paper. Paper separation for recycling is a new initiative by PMP. Colour coded waste and recycling bins are another new introduction at the Moorebank site.

Improving press machine tolerances has resulted in improved efficiency. Outcomes include less stress on the web resulting in fewer breaks.

Case Study: Pre press Revolution—Change to Computer to Plate (CTP)

The printing industry is undergoing a major technological shift from photographic based prepress operations to fully digital.

Photographic processes involve assembling of hundreds of photos that are cut and pasted to make the final page of what will be printed. Then the final page image is broken into its primary colours, usually yellow, magenta cyan and black. Other special colours can be added if required such as gold silver or a corporate colour mix. As each plate is made up of many pasted together photographs and text, many imperfections appear on the final plate once it is developed. So each plate is hand corrected, with the cuts nicks and marks filled in and the plate redeveloped. Therefore every photo requires developing, the final bromide is split into it primary colours for printing, developing, with the printing plate being developed twice. This adds up to a lot of waste film, photographic chemicals and wash water.

With computer to plate, no bromide is required. Most photos used are digitally obtained and added, so film use and developing is not required. Each printing plate, according to its primary colour is 'developed' by a laser printer specially designed for printing plates. Each plate is developed once. No need to clean up nicks and marks as there should be none—unless the proofing is flawed.

This is what happened to PMP after they converted to CTP. They noticed a halving of their water and photographic bills. With a little more effort, to make sure the developing machine ended it wash cycle after the plate went through and not 30 seconds after, resulted in further water savings.

The future offers direct plate making on the press. No developing required at all. No film, no photographic chemicals and no wash waters. This will also dramatically cut the number of plates sent for recycling or landfill.

Automatic plate developing machine, which was adjusted to further cut water waste.

Computer to plate laser printer, drawing directly on to the printing plate. The plate is attached directly to the printing press.

5.5 Websdale Printing

Background

A medium sized lithographic printing company.

They operate:

- 4 large sheet fed lithographic press (6x6 and 4x4 colour presses) one with water free print capability
- 2 full binding lines
- Cutting
- Computer to plate making

Waste Generation:

Employment: 170 Consumption 20,000 tonnes pa

Total Waste generation:	1,825 tpa	
Recycled	1,200 tpa	(66%)
Landfilled wastes	600 tpa	(33%)
Hazardous wastes	25 tpa	(1%)

Waste types: to landfill

Paper, cardboard, ink cans, floor sweepings, food wastes, plastic wastes, plastic binding straps rags and wipes, polymer plates,

Hazardous wastes disposed :

Solvents ink and water mixtures

Waste types recycled:

Paper, white paper, cardboard, solvents, solvents and photographic wastes

Waste Management

Websdale use the latest technologies in sheet fed lithographic printing.

The new presses feature ink cartridges, which are fully recyclable. They even chip the old cartridges on site to gain higher prices from the recycling company.

Websdale measure their waste closely and prides its self on its waste management and efficiency. Many of its customers are demanding environmental friendly printing practices. Use of digitally aligned presses cuts spoilage to 10% for small runs of 5,000 to spoilage of 5% for runs over 50,000.

Websdale wishes to continue to expand its efficiency and waste minimisation programs. They are looking a further improvements to their binding operations and a possible move over to pressure fed inks, although this would be a major cost and change.

Websdale take full advantage of computer to plate technology and attention to details in job specifications and client feedback. Such attention assists in cutting errors and generating wasted product.

Management of waste is part of Websdale's operational systems, which also includes energy management. All spoilage and printing runs are electronically collected and analysed for benchmarking purposes.

For its size Websdale is a leading example of what can be achieved in environmental management, waste reduction, process efficiency and cost savings.

Websdale's new 6 by 6 double sided lithographic press has the latest blanket wash recycling system installed — a major money saving feature.

The press also uses ink cartridges, which eliminates use of ink tins. The plastic cartridges are made from recyclable polypropylene and are chipped on site prior to sending to the plastic recycling company.

Improvements in binding efficiency should be relayed to the press area so to reduce the need for over printing due to down stream errors.

Waste management companies offer onsite equipment to collect off-cuts for recycling.

Case Study: Solvent Recycling Cuts Purchase Costs And Reduces Waste

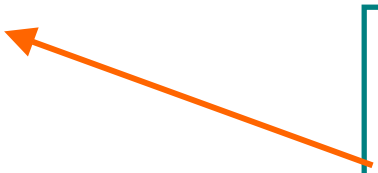
Websdale has installed an innovative waste minimisation technology, which has cut their solvent use by 85%.

Virtually all lithographic printing process require the use of blanket washes. The blanket, the rubber roller that passes the ink on to the paper or print medium, requires regular cleaning. Paper dust, or other imperfections must be removed from the blanket and accompanying rollers regularly through the print run and especially at the end of the run. Otherwise the print quality will be poor or unsaleable.

Older lithographic presses require manual cleaning, generally with a volatile solvent, which is usually a flammable class 3 dangerous good. Rags and wipes contaminated from this process are another waste management concern, but this is discussed later.

Larger and newer presses can be fitted with automatic blanket wash. A series of high-pressure jets, possibly accompanied with brushes, clean the blanket in a robot fashion. While the automatic blanket washes virtually eliminate contaminated rags and wipes, it tends to use more solvent than a manual cleaning system, though this is dependent on the operator.

In Websdale's case they purchased a state of the art blanket wash recycling system. This system separates water and the inks from the solvent by way of ultra filtration. Their in-house automatic blanket wash recycling system had a pay back of 14 months and saves about 100,000 litres pa of new solvent.



Here is another example of a blanket wash recycling plant from another printer. It separates the water using a centrifuge and then filters the ink out of the solvent. Fresh solvent is required as not all the ink can be removed.

5.6 Amcor Flexible Packaging

A large flexographic printing company, which largely prints onto polymers for consumer packaging.

They operate

- 4 web fed flexographic presses
- 2 web fed gravure presses
- Cutting
- Flexographic roller making
- Gravure roller making

Waste Generation

Employment: 220 Consumption 30,000 tonnes pa (polymer mainly)

Total Waste generation:	5,440 tpa	
Recycled	3,960 tpa	(73%)
Landfilled wastes	1,300 tpa	(24%)
Hazardous wastes	180 tpa	(3%)

Waste types: to landfill

Plastic, foils, floor sweepings, food wastes, old cores, plastic binding straps rags and wipes, flexogrphic plates,

Hazardous wastes disposed

Solvents, inks, still bottoms

Waste types recycled

Polymer, cardboard, solvents, solvents and ink and photographic wastes

Waste Management

Amcor are a large printing company that also manufactures cardboard, papers and polymer sheet for the printing industry. The Revesby site specialises in flexographic printing on polymer sheet. Waste minimisation and management practices have been on going on the site for over 10 years. Weighing of most waste is not undertaken except for use of weighbridge dockets supplied by waste contractors. A few types of waste can be weighed prior to leaving the site. Most waste generation and its minimisation us undertaken using visual measurement techniques.

The flexograpic and gravure processes require quick drying inks, requiring the use of volatile solvents, the blends of which change to suit jobs, inks and weather conditions. Due to the process a combination of solvent types are used. Inks are reworked in to the next jobs as required. The ink supplier under contract undertakes such reworking. Ink and solvent wastes are recycled on site by a scraped surface distillation unit. Recycled solvents are used for cleaning parts and floors of excess inks. Where excess solvent is generated it is sold to recycling companies.

Management teams have achieved cut waste from the web based press areas. Continuous improvement in respect of efficiency and waste management is part of the management procedures. For example, staff are trained to change web rollers only when a small amount of polymer is left on the previous roll.

Most of the product leaves the site on small cores for use in customers filling lines. These cores are made from the larger cores from the web rolls. A section of the factory is dedicated to resizing the cardboard cores.

Packaging materials from supplies are also recycled in-house where they can. Wood from packaging is remade into other packaging for final product delivery. Extensive recycling of steel, aluminium, wood pallets and plastic waste are undertaken at the site.

The site has a dedicated recycling area that also manages recycling of wastes from other Amcor sites.

This is one of Amcor's flexographic presses printing on polymer for food packaging – hygiene is very important on this site.

6

Amcor has a dedicated recycling area, where solvents, cores, drums, pails and wood packaging are recycled. This recycling area serves a number of

Amcor recycles most of their solvents. As the flexographic process relies on volatile solvents, ink and solvent recycling is a major cost reduction activity. This is the scraped surface distillation unit. Recycled solvents are reused for cleaning of floors and parts. They cannot be used for ink dilution.

THE SEMINAR

The proposal for the project involved developing two training modules. The first to be developed was the seminar titled **Profiting & Efficiency From Waste Management for Printers**. In order to provide a set of quick solutions and possible actions that many printers can undertake the seminar focused on tips from other printers on how to cut waste, save money and improve productivity. The full seminar slides and notes appear in Appendix 4.

6.1 Content

The final product was as set of 57 PowerPoint slide supplemented with notes and explanations about the information presented on each slide. It is divided up into the following sections:

- Introduction

  Describes the grant and the involvement of the NSW Government. Looks at the 'What is in it for me?' question on waste minimisation. Reviews NSW environmental laws and major environmental risks for printers. A few Land And Environment Court case studies are provided. Links waste management to plant efficiency.

- Waste & its Measurement
  Following up on the finding of the waste survey that over 56% of printers do not measure their waste, this section focused on encouraging the measuring of wastes. It covered basic methods to measure waste and obtain waste quantity data. For example, ask your waste contractor to supply weighbridge results of you waste bins (assuming you have your own bin).
- Cutting waste and problem wastes

  This section focuses on actions to cut wastes. Staff training, waste segregation, use of color coded bins are typical examples of the details in this section. A number of good tips are provided such as looking at your inventory and the way in which you purchase goods. How are they packaged? Does the packaging become waste or is it recycled or sent back to the supplier? A simple classification of printer's wastes is provided to assist in recycling an segregation. Inks solvents chemicals and wood were identified in the survey as problem wastes. Various solutions to better managing these wastes were provided. Other wastes such as metals and plastics are also covered.

- Innovative solutions & case studies
  The case study of changing blanket wash from a flammable class 3 dangerous good solvent to a non-dangerous good blanket wash. Such a change permits blanket wash contaminated rags and wipes to be able for disposal into a normal trade waste bin. If all dangerous goods are eliminated then there may be no need for the DG store.
  Recycling of blanket wash solvent saved one printer over 100,000 liters pa, cutting their solvent use by 85%.
- Improving efficiency & workshop

  Use of benchmarking information to set where you are and what an improvement looks like is the feature of this section. In effect waste management must be linked to change management and process efficiency.

- Environmental Image

  Discusses the advantages of improving waste management at a printer's site and how this can be marketed to clients as an additional service to clients who are looking for more environmentally friendly suppliers. It also advantages the entire printing industry as it promotes a more green image.

- Summary**6.2 Promotion of the Seminar**

Printing Industries undertook the following promotional activities for the seminar:

- Mail out of a flyer on the seminar
- Handout of flyers at areas meetings of printers
- Media release on the seminar
- Holding a talk on the project at the Printing Industries Annual Conference (approximately 200 delegates) at Terrigal and at the Digit Expo (approximately 400 delegates) at Darling Harbour
- Posting dates for the seminars in the Printing Industries annual functions brochure
- Undertaking telemarketing of the seminar courses to boost numbers

The promotional material is contained in Appendix 5, which also covers the promotional material for the workshop.

6.3 Attendance and comments

The project brief calls for six seminars to be conducted. Unfortunately to date only four have had enough number for the seminars to progress. This is despite considerable efforts by Printing Industries in promoting the course. Nevertheless, Printing Industries will continue to promote and run the seminar.

SEMINAR ATTENDANCE RESULTS

Date	Venue	Attendance
31/10/02	Mascot	26
14/11/02	Parramatta	28
18/03/03	Newcastle	10
21/03/03	Wollongong	9

Comments from the seminar were positive. A number of delegates offered additional case studies from their own site and experience.

One example of this was the difficulty in getting consistent performance from binding operations. As jobs vary demand for binding staff varies more than for other parts of the printing process. As a consequence, there is a high churn of staff on the binding machinery making consistent performance operation difficult. Training is on option, but some staff may be on the job for less than a week, even a few days.

7 THE WORKSHOP

The workshop is designed to complement the seminar. While the seminar focuses on good ideas and touches upon benchmarking, the workshop provides a toolbox of approaches to implement with the goal of achieving real change management. The full workshop titled **Printing Industry Waste Workshop** (the workshop) slides and notes appears in Appendix 6.

7.1 Content

The final product was as set of 67 PowerPoint slides supplemented with notes and explanations about the information presented on each slide. It is divided up into the following sections:

- Overview – how to start on waste

  The workshop begins with an overview of the project and an introduction to the NSW Government agencies involved in waste, mainly the EPA and Resource NSW. Emphasis is placed on the need to gain senior management commitment prior to starting any form of waste minimisation program. Without such support any actions tend to be token and ignored.

  A case study on equipment change results in spin-off reductions in waste and efficiency improvements. Financials are used to stress the gains that such improvements can achieve.

- Basic waste auditing & case study

  Waste auditing is the suggested starting point. The workshop goes through the process of setting up an audit, it pre-planning, management review, desktop analysis, process analysis, feasibility studies and implementation. This section features attention to budgets and who is responsible for waste. The section ends with an introduction to benchmarking.

- Measuring wastes – how?

  Noting that the waste survey found that over 56% of printers do not measure their waste, this section focused on methods for measuring wastes. It covered basic methods to measure waste and obtain waste quantity data. It introduced the concept of mass balance and uses paper as an example. Basically put mass balance requires the balancing of the amount of paper in to be equal to the amount of paper leaving the site as product or as waste to landfill or to recycling. A case study on paper waste is provided. (see section 5.4 PMP case study)

  Measurement of waste also covers visual and weighing methods and includes a number of pictures showing how.

- Efficient practices

  The concept of a bottom up approach to efficiency is introduced. Its catch phrase is that *every waste stream is an indicator of inefficiency*. The Waste Optimization Study is introduced as a tool in which to reduce waste and improve process efficiency. The five phases of process operations are demonstrated. A typical printing operation is divided into its component unit operations, which each allocated a supplies and waste streams.

- Practical workshop for participants

  The workshop part of the course requires participants to identify wastes from each of the following areas; pre-press, press area; binding and other post press areas and packaging and shipping. Proformas are used for participants to think of other wastes that can be generated from each section of their operations.

- Benchmarking - Getting the information back into the company

  A number of case studies are provided to identify how to benchmark and what typical benchmarking activities printers use. Web and sheet fed benchmarking data are provided on make ready waste and make ready time. It also looks at press stops.

- Summary

7.2 Promotion of the Workshop

Printing Industries undertook the following promotional activities for the seminar:

- Mail out of a flyer on the seminar
- Handout of flyers at areas meetings of printers
- Media release on the seminar
- Holding a talk on the project at the Printing Industries Annual Conference (approximately 200 delegates) at Terrigal and at the Digit Expo (approximately 400 delegates) at Darling Harbour.
- Posting dates for the workshops in the Printing Industries annual functions brochure
- Undertaking telemarketing of the seminar courses to boost numbers

7.3 Attendance and comments

The project brief calls for four workshops to be conducted. Unfortunately to date only one have had enough number for the workshop to progress. This is despite considerable efforts by Printing Industries in promoting the course. Nevertheless, Printing Industries will continue to promote the seminar

WORKSHOP ATTENDANCE RESULTS

Date	Venue	Attendance
19/02/03	Sydney	10

Comments from the workshop were positive. A number of delegates offered additional case studies from their own site and experience.

The main supportive comment was that the workshop provided excellent information on how to improve management systems used at printing sites.

Overall Printing Industries and AEBN the consultant will continue to conduct the workshops to at least cover the 3 as stated in the proposal for the project.

7 CONCLUSION

A major outcome of the undertaking of this project is the recognition that the main obstacle to printers improving their environmentally friendly practices is one of change. Change in attitude towards becoming more efficient and productive through waste reduction strategies can lead to savings and improvements. A set of drivers for printers to adopt waste minimisation management techniques will continue to be used to impart a need to change on the management of printing companies. Promotion of these drivers will continue to be pursued by the Printing Industries in order to lift the public environmental image and profitably of the printing industry in Australia.

Change management methods along with waste management tools were exploited in the project's educational section. Use of these combined techniques was based on the findings from the survey and analysis of the 6 printing companies. This crystallised into the use of benchmarking as a method to achieve continuous improvement in waste management. Following on from this project is the Printing Industries Annual Benchmarking Program which expands on waste and environmental issues covered in this project's survey and activities, to cover a wide range of performance issues where printers can compare themselves against an industry average.

The survey on printers provided a useful benchmark level for future assessment of the printing industry. This can be explored further with the Printing Industries Benchmarking Program, which can be related back to the findings in the survey.

Most importantly will be improvements in the measurement of wastes across the industry. As identified, only 44% of printers measure their wastes in any form other than spoilage. It is believed that the seminars talks and workshop have contributed to and will continue to produce a positive effect in changing the way in which printers will deal with waste issues.

Combined the seminars and workshop have reached over 80 participants representing 54 printing and related companies. An ongoing commitment to run further seminars and workshops and talks on environmental and waste issues will see these numbers increase. While the delivery of the educations modules did not reach expectations in terms of numbers of courses run, the seminar and workshop programs will continue to be delivered to the printing industry. A substantial amount of useful information has been collated into these training packages; it is just a case of getting printers to allocate appropriate time to learn of the advantages they offer.

Outcomes of the training packages have been well received, however, their real impact on the behaviour of printers will be determined through future surveys, such as the annual benchmarking survey.

Printers and educational providers can use many of the leasons and case studies identified well into the future. As a consequence the usefulness of the information gained in this project will continue to aid the printing industry.

8 Glossary of Printing Terms

Accordion fold: Bindery term, two or more parallel folds which open like an accordion.

Against the grain: At right angles to direction of paper grain.

Alteration: Change in copy of specifications after production has begun.

Artboard: Alternate term for mechanical art.

Author's corrections: Also know as "AC's". Changed and additions in copy after it has been typeset.

Back up: Printing the second side of a sheet already printed on one side.

Banding: Method of packaging printed pieces of paper using rubber or paper bands.

Basis weight: Weight in pounds of a ream of paper cut to the basic size for its grade.

Bind: To fasten sheets or signatures with wire, thread, glue. or by other means.

Bindery: The finishing department of a print shop or firm specializing in finishing printed products.

Blanket: The thick rubber mat on a printing press that transfers ink from the plate to paper.

Bleed: Printing that goes to the edge of the sheet after trimming.

Blind embossing: An image pressed into a sheet without ink or foil.

Blueline: A blue photographic proof used to check position of all image elements.

Board: Alternate term for mechanical.

Bond & carbon: Business form with paper and carbon paper.

Bond paper: Strong durable paper grade used for letterheads and business forms.

Break for color: Also known as a color break. To separate mechanically or by software the parts to be printed in different colors.

Brightness: The brilliance or reflectance of paper.

Bulk: Thickness of paper stock in thousandths of an inch or number of pages per inch.

Bulk pack: Boxing printed product without wrapping or banding.

Burn: Exposing a printing plate to high intensity light or placing an image on a printing plate by light.

Butt: Joining images without overlapping.

Butt fit: Printed colors that overlap one row of dots so they appear to butt.

Carbonless: Pressure sensitive writing paper that does not use carbon.

Caliper: Paper thickness in thousandths of an inch.

Camera-ready copy: Print ready mechanical art.

Carload: A truck load of paper weighing 20 tonnes.

Case bind: A type of binding used in making hard cover books using glue**.**

Cast coated: Coated paper with a high gloss reflective finish.

Chrome: A term for a transparency.

Coated paper: Clay coated printing paper with a smooth finish.

Collate: A finishing term for gathering paper in a precise order.

Color bar: A quality control term regarding the spots of ink color on the tail of a sheet.

Color correction: Methods of improving color separations.

Color filter: Filters uses in making color separations, red, blue, green.

Color key: Color proofs in layers of acetate:

Color matching system: A system of formulated ink colors used for communicating color.

Color separations: The process of preparing artwork, photographs, transparencies, or computer generated art for printing by separating into the four primary printing colors.

Comb bind: To plastic comb bind by inserting the comb into punched holes.

Composite film: Combining two or more images on one or more pieces of film.

Continuous-tone copy: Illustrations, photographs or computer files that contain gradient tones from black to white or light to dark.

Contrast: The tonal change in color from light to dark.

Copy: All furnished material or disc used in the production of a printed product.

Cover paper: A heavy printing paper used to cover books, make presentation folders, etc.

Crash number: Numbering paper by pressing an image on the first sheet which is transferred to all parts of the printed set.

Crimping: Puncture marks holding business forms together.

Cromalin: Trade name for DuPont color proofs.

Crop: To cut off parts of a picture or image.

Crop marks: Printed lines showing where to trim a printed sheet.

Crossover: Printing across the gutter or from one page to the facing page of a publication.

Cyan: One of four standard process colors. The blue color.

Densitometer: A quality control devise to measure the density of printing ink.

Density: The degree of color or darkness of an image or photograph.

Diazo: A light sensitive coating used on printing plates.

Die: Metal rule or imaged block used to cut or place an image on paper in the finishing process.

Die cutting: Curing images in or out of paper.

Dot: An element of halftones. Using a loupe you will see that printed pictures are made many dots.

Dot gain or spread: A term used to explain the difference in size between the dot on film v paper.

Double burn: Exposing a plate to multiple images.

Draw-down: A sample of ink and paper used to evaluate ink colors.

Drop-out: Portions of artwork that do not print.

Dummy: A rough layout of a printed piece showing position and finished size.

Duotone: A halftone picture made up of two printed colors.

Dylux: Photographic paper made by DuPont and used for bluelines.

Emboss: Pressing an image into paper so that it will create a raised relief.

Emulsion: Light sensitive coating found on printing plates and film.

Eurobind: A patented method of binding perfect bound books so they will open and lay flatter.

Facsimile transmission: The process of converting graphic images into electronic signals**.**

Film rip: See Rip film.

Flat: An assembly of negatives taped to masking materials for platemaking.

Flood: To cover a printed page with ink, varnish, or plastic coating.

Flop: The reverse side of an image.

Foil: A metallic or pigmented coating on plastic sheets or rolls used in foil stamping and foil embossing.

Foil emboss: Foil stamping and embossing a image on paper with a die.

Foil stamping: Using a die to place a metallic or pigmented image on paper.

4-color-process: The process of combining four basic colors to create a printed color picture or colors composed from the basic four colors.

French fold: Two folds at right angles to each other.

Galley proof: Text copy before it is put into a mechanical layout or desktop layout.

Gang: Getting the most out of a printing press by using the maximum sheet size to print multiple images or jobs on the same sheet. A way to save money.

Generation: Stages of reproduction from original copy. A first generation reproduction yields the best quality.

Ghost bars: A quality control method used to reduce ghosted image created by heat or chemical contamination.

Ghosting: A faint printed image that appears on a printed sheet where it was not intended. More often than not this problem is a function of graphical design. It is hard to tell when or where ghosting will occur. Sometimes you can see the problem developing immediately after printing the sheet, other times the problem occurs while drying. However, if the problem occurs it is costly to fix, if it can be fixed. Occasionally it can be eliminated by changing the color sequence, the inks, the paper, changing to a press with a drier, printing the problem area in a separate pass through the press or changing the racking (reducing the number of sheets on the drying racks). Since it is a function of graphical design, the buyer pays for the increased cost.

Gloss: A shiny look reflecting light**.**

Grain: The direction in which the paper fiber lie.

Grippers: The metal fingers on a printing press that hold the paper as it passes through the press.

Hairline: A very thin line or gap about the width of a hair or 1/100 inch.

Halftone: Converting a continuous tone to dots for printing.

Hard copy: The output of a computer printer, or typed text sent for typesetting.

Hickey: Reoccurring unplanned spots that appear in the printed image from dust, lint, dried ink.

High-bulk paper: A paper made thicker than its standard basis weight.

Highlight: The lightest areas in a picture or halftone.

Image area: Portion of paper on which ink can appear.

Imposition: Positioning printed pages so they will fold in the proper order.

Impression: Putting an image on paper**.**

Imprint: Adding copy to a previously printed page.

Indicia: Postal information place on a printed product.

Ink fountain: The reservoir on a printing press that hold the ink.

Keylines: Lines on mechanical art that show position of photographs or illustrations**.**

Kiss die cut: To cut the top layer of a pressure sensitive sheet and not the backing.

Knock out: To mask out an image.

Laid finish: Simulating the surface of handmade paper.

Laminate: To cover with film, to bond or glue one surface to another**.**

Layflat: See Eurobind.

Line copy: High contrast copy not requiring a halftone.

Lines per inch: The number of rows of dots per inch in a halftone.

Loupe: A magnifying glass used to review a printed image, plate and position film.

Magenta: Process red, one of the basic colors in process color.

Makeready: All the activities required to prepare a press for printing.

Marginal words: Call outs for directions on various parts of a business form.

Mask: Blocking light from reaching parts of a printing plate.

Matchprint: Trade name for 3M integral color proof.

Matte finish: Dull paper or ink finish.

Mechanical: Camera ready art all contained on one board.

Mechanical separation: Mechanical art overlay for each color to be printed.

Micrometer: Instrument used to measure the thickness of different papers**.**

Middle tones: The tones in a photograph that are approximately half as dark as the shadow area.

Moire: Occurs when screen angles are wrong causing odd patterns in photographs**.**

Negative: The image on film that makes the white areas of originals black and black areas white.

Non-reproducing blue: A blue color the camera cannot see. Used in marking up artwork.

Offsetting: Using an intermediate surface used to transfer ink. Also, an unpleasant happening when the images of freshly printed sheets transfer images to each other.

Offset paper: Term for uncoated book paper.

Ok sheet: Final approved color inking sheet before production begins.

Opacity: The amount of show-through on a printed sheet. The more opacity or the thicker the paper the less show-through. (The thicker/heavier the paper the higher the cost.)

Outline halftone: Removing the background of a picture or silhouetting an image in a picture.

Overlay: The transparent cover sheet on artwork often used for instructions**.**

Overrun or overs: Copies printed in excess of the specified quantity. (Printing trade terms allow for + - 10 % to represent a completed order.)

"Ozalid" is the name of a company that markets diazo process products and equipment that makes diazo blueline prints used primarily in the US by engineering and architectual firms. However diazo or "Ozalid" proofs are most often used in England, other European, Hong Kong, Korean, and Singapore by printers as the proofing means comparable to our Dylux, or Blueline proof.
Page count: Total number of pages in a book including blanks**.**

Pattern carbon: Special carbon paper used in business forms that only transfers in certain areas.

Perfect bind: A type of binding that glues the edge of sheets to a cover like a telephone book, Microsoft software manual, or Country Living Magazine.

Perfecting press: A sheet fed printing press that prints both sides of a sheet in one pass.

Pica: Unit of measure in typesetting. One pica = 1/6 inch.

Picking: Printers nightmare that occurs as the surface of a sheet lifts off during printing. Generally a paper manufactures quality control problem.

Pin register: A standard used to fit film to film and film to plates and plates to press to assure the proper registration of printer colors.

Plate gap: Gripper space. The area where the grippers hold the sheet as it passes through the press.

PMS: The abbreviated name of the Pantone Color Matching System.

PMT: Abbreviated name for photomechanical transfer. Often used to make position prints.

Point: For paper, a unit of thickness equaling 1/1000 inch. for typesetting, a unit of height equaling 1/72 inch.

PostScript: The computer language most recognized by printing devices.

Press number: A method of numbering manufacturing business forms or tickets.

Pressure-sensitive paper: Paper material with self sticking adhesive covered by a backing sheet.

Process blue: The blue or cyan color in process printing**.**

Process colors: Cyan (blue), magenta (process red), yellow (process yellow), black (process black).

Ragged left: Type that is justified to the right margin and the line lengths vary on the left.

Ragged right: Type that is justified to the left margin and the line lengths vary on the right.

Ream: Five hundred sheets of paper.

Recto: Right-hand page of an open book.

Reflective copy: Copy that is not transparent.

Register: To position print in the proper position in relation to the edge of the sheet and to other printing on the same sheet.

Register marks: Cross-hair lines or marks on film, plates, and paper that guide strippers, platemakers, pressmen, and bindery personnel in processing a print order from start to finish.

Reverse: The opposite of what you see. Printing the background of an image. For example; type your name on a piece of paper. The reverse of this would be a black piece of paper with a white name.

Rip film: A method of making printing negatives from PostScript files created by desktop publishing.

Saddle stitch: Binding a booklet or magazine with staples in the seam where it folds.

Scanner: Device used to make color separations, halftones, duo tones and tri tones. Also a device used to scan art, pictures or drawings in desktop publishing.

Score: A crease put on paper to help it fold better.

Screen angles: Frequently a desktop publishers nightmare. The angles at which halftone, duo tones, tri tones, and color separation printing films are placed to make them look right**.**

Self-cover: Using the same paper as the text for the cover.

Shadow: The darkest areas of a photograph.

Show-through: Printing on one side of a sheet that can be seen on the other side of the sheet.

Side guide: The mechanical register unit on a printing press that positions a sheet from the side.

Side stitch: Binding by stapling along one side of a sheet.

Signature: A sheet of printed pages which when folded become a part of a book or publication.

Silhouette halftone: A term used for an outline halftone.

Skid: A pallet used for a pile of cut sheets.

Specifications: A precise description of a print order.

Spine: The binding edge of a book or publication.

Split fountain: Putting more than one ink in a printing fountain to achieve special color affects.

Spoilage: Planned paper waste for all printing operations.

Spot varnish: Varnish used to hilight a specific part of the printed sheet.

Stamping: Term for foil stamping.

Stat: Term for inexpensive print of line copy or halftone.

Step-and-repeat: A procedure for placing the same image on plates in multiple places**.**

Stet: A proof mark meaning let the original copy stand**.**

Stock: The material to be printed.

Stripping: The positioning of film on a flat prior to platemaking.

Substance weight: A term of basis weight when referring to bond papers.

Substrate: Any surface on which printing is done. eg paper, board, polymer

Text paper: Grades of uncoated paper with textured surfaces.

Tints: A shade of a single color or combined colors.

Tissue overlay: Usually a thin transparent paper placed over artwork for protection uses for marking color breaks and other printer instructions.

Transfer tape: A peel and stick tape used in business forms.

Transparency: A positive photographic slide on film allowing light to pass through.

Transparent copy: A film that light must pass through for it to be seen or reproduced.

Transparent ink: A printing ink that does not conceal the color under it.

Trapping: The ability to print one ink over the other.

Trim marks: Similar to crop or register marks. These marks show where to trim the printed sheet.

Trim size: The final size of one printed image after the last trim is made.

Under-run: Production of fewer copies than ordered. See over run.

Up: Printing two or three up means printing multiple copies of the same image on the same sheet.

UV coating: Liquid laminate bonded and cured with ultraviolet light. Environmentally friendly.

Varnish: A clear liquid applied to printed surfaces for looks and protection. (UV coating looks better.)

Verso: The left hand page of an open book.

Vignette halftone: A halftone whose background gradually fades to white.

Washup: Removing printing ink from a press, washing the rollers and blanket. Certain ink colors require multiple washups to avoid ink and chemical contamination.

Waste: A term for planned spoilage.

Watermark: A distinctive design created in paper at the time of manufacture that can be easily seen by holding the paper up to a light.

Web: A roll of printing paper.

Web press: The name of a type of presses that print from rolls of paper.

Wire O: A bindery trade name for mechanical binding using double loops of wire through a hole.

Wire-O binding: A method of wire binding books along the binding edge that will allow the book to lay flat using double loops. See Wire O.

With the grain: Folding or feeding paper into the press or folder parallel to the grain of the paper.

Work and tumble: Printing one side of a sheet and turning it over from the gripper to the tail to print the second side using the same side guide and plate for the second side.

Work and turn: Printing one side of a sheet and turning it over from left to right ussing the same side guides and plate for the second side.

Wove paper: A paper having a uniform unlined surface with a smooth finish.