Cleaner production to drive water efficiency

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ABSTRACT

South East Water Limited (SEWL) commenced the cleaner production program in 2006. The program has allowed SEWL to engage with industrial customers to reduce Total Dissolved Solids (TDS), colour and heavy metals. It has also had the benefit of reducing water consumption. The holistic approach to water saving projects has allowed a better understanding of the actual pay back on projects. In addition to this work, the Smart Water Fund commissioned a review of industrial ecology opportunities for Melbourne. This project was completed in 2008. The paper outlines the project outcomes and how it has been embedded in the cleaner production program at South East Water.

Key words | clean production, efficient use, industrial ecology, sustainability, water recycling

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INTRODUCTION

The Cleaner Production Program at SEWL commenced in 2006. The program was developed in response to drivers for the sustainable reuse of recycled water and biosolids. TDS, heavy metals and colour have been identified as having a significant impact on the sustainable reuse of both recycled water and biosolids.

The Smart Water Fund commissioned a review of industrial ecology opportunities in Melbourne. The project identified the Port Melbourne Industrial Area as a potential opportunity for industrial ecology to occur. The study was completed in 2008.

South East Water Limited (SEWL) has used this project as a basis for developing other programs to identify resource efficiency opportunities.

BODY OF THE PAPER

The Cleaner Production Program drivers were to reduce the impact of TDS and colour in recycled water.

The projects incorporated the following steps:

- Mass balance of the industrial process;
- Workshop with key staff to generate resource efficiency opportunities;
- Development of key opportunities including costing and pay back period;
- Final report which provides direction to the company on how to progress the opportunities.

The program has been highly successful in identifying water savings.

Cultural shift

The Cleaner Production Program has been successful in not only identifying water saving opportunities but setting up a culture for further savings. This has been primarily achieved through the development of a project team within the company. In most cases these project teams have continued to meet to progress the cleaner production projects and have become champions for water saving projects within the business.

The development and continuation of the project teams is resulting in water savings above and beyond the savings identified in the cleaner production project.

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Understanding water use

The purpose of the cleaner production study is to identify where trade waste is discharged in the industrial process. This is also resulting in a greater understanding of water use within the processes. In particular, the Clean in Place (CIP) system is a focus due to the high TDS discharge load. A number of reviews which have been conducted of the CIP system not only have identified TDS savings but have also identified water savings through the opportunity to reuse the final rinse and to reduce wash times of the during the CIP.

Project pay back periods

The pay back on water savings projects is often poor. The holistic approach of including energy, trade waste costs and product losses improves the overall pay back of projects.

What is industrial ecology?

In general terms, industrial ecology is the transfer of "waste" from one industry as an input into another industry. "Waste" refers to water, energy and solid waste. The concept that waste becomes a raw input to another industry changes the value we place on that waste.

The three principals for industrial ecology are:

1. A systemic, comprehensive, integrated view of all components of an industrial system and its relation to the biosphere;
2. An emphasis on the complex patterns of material flows within and outside the industrial system, as opposed to focusing on single flows;
3. The importance of technological dynamics and the role of key technologies in driving the long term evolution of a sustainable industrial ecosystem. (Edge Environment).

Industrial ecology can occur either within an individual business or on a local scale by an industrial area or cluster.

Smart water fund study

The Smart Water Fund was established by the Victorian Government and Melbourne Water Retailers. This fund was formed to develop innovative approaches to water and biosolids recycling and water saving projects.

The Smart Water Fund commissioned a review into industrial ecology opportunities in Melbourne. There were two main aims for this study. The first aim was to identify short to medium term opportunities to reduce impact of wastewater from industries through the cycling of resources between firms. The second aim was to identify strategic opportunities in Melbourne for further targeted research.

The scope of the industrial ecology opportunities included:

- Be located in greater Melbourne;
- Involve the recycled of water, the energy associated with heating water or contaminants within a wastewater stream;
- Ability to be implemented within the next 5 years after the completion of the project;
- Demonstrate the recycling of a resource that is considered by industry stakeholders to be a critical resource in the region of Melbourne.

This project was the first of its kind in Victoria.

This Study identified the Port Melbourne Industrial area which contains a range of industries ranging from food and industrial manufacturing through to construction.

The study was prepared by Institute of Sustainable Futures, University of Technology, Sydney (Kazaglis *et al.* 2007).

Smart water fund study—Port Melbourne

An initial workshop was held to gauge the interest of the companies. During the workshop a survey was conducted of each of the industries. The survey questions were limited to water use and effluent discharge. This information was presented as an overlay on the GIS system.

An inventory of water requirements from each business was established. The potential water suppliers and water sinks were identified and an analysis undertake of the treatment options and costs.

Two broad options were identified with a number of sub-options under these. The broad options were:

- One to one exchange.
- Centralised treatment facility.

The recycled water volume was 250 kL/day or approximately 60 ML/yr. The cost of the recycled water ranged from $9/kL through to $27/kL. All the treatment options were energy intensive. An activated sludge-membrane bioreactor system (AS-MBR) as a centralised treatment system was considered the most cost effective treatment option with a total cost of $9/kL.

A final workshop was held with the companies and a commitment was made for the group to continue meeting.

Benefits

The benefits of using industrial ecology principals include:

Saving water–Melbourne is experiencing ongoing drought conditions. The substitution of industrial water for potable water contributes to water conservation.

Water prices–water prices are increasing and, like trade waste prices, are expected to increase by 20% each year for five years. By accessing alternative water sources there is potential to reduce the impact of the price rises for potable water.

Trade waste prices- trade waste prices are increasing. It is anticipated that there will be a 20% increase each year for five years. This is driving companies to reduce trade waste discharges. As water recycling become more important there will be a greater focus on the quality of trade waste discharged (Giurco *et al.* 2008, 2009).

Limitations of the study

Further work is still required on pilot testing of water qualities and detailed design of treatment systems. None of the options identified were considered economically attractive due to the high costs of the treated water.

The scope of the study focused on end of pipe solutions. This resulted in treatment options that were costly.

The treatment options also required a final water quality to meet 'Class A'. Further analysis is required to identify 'fit for purpose' water quality requirements.

The study only looked at water recycling opportunities. Further expansion to look at energy, prescribed water and waste to landfill may identify other opportunities.

There were perceived water quality issues for some of the companies. This included both the potential impact on product quality and the impact on health and safety of workers. These issues would need to be addressed in greater detail for a recycled water scheme to be developed.

Further development

In 2008 Kraft formed a partnership with the West Gate Freeway Alliance to utilise industrial water for dust suppression and road construction activities.

Kraft had identified relative clean process water which would be 'fit for purpose' water. The industrial water required minimal pre-treatment, making the overall costs of the project significantly cheaper than an end of pipe solution.

This water sharing initiative has become a significant platform for other recycled water opportunities in the Port Melbourne area.

Port Melbourne industrial ecology group

In July 2009 the Port Melbourne Industrial Ecology Group met. The workshop was facilitated by Dr Paul Tebo. The EPA and Sustainability Victoria had representatives at the workshop.

The workshop was divided into two sessions. In the first session each company was asked to rate the financial impact of the following environmental issues both now and in 2020:

- Energy;
- Salt;
- Water;
- Prescribed waste;
- Waste to landfill.

All companies reported that the financial impacts of these environmental issues were going to increase over time. The second session involved the identification and development of five projects. These projects included a:

- Centralised water sharing project;
- Neighbour to neighbour water sharing project;
- Energy project;
- Salt mass balance project;
- Further development of the Smart Water Fund Project.

Each project was allocated a company to take the lead on the project and report back at the next meeting.

Industrial ecology at SEW

The Victorian water industry is facing some key environmental challenges. Reduced rainfall, climate change and ensuring the sustainable supply of recycle water is resulting in the need for SEWL to work closely with its Industrial Customers to reduce water consumption and reduce both TDS and colour in trade waste discharges.

SEW has been running a cleaner production program since 2007. The cleaner production program is run in partnership with the Victorian Environmental Protection Authority. Over 20 companies have participated in the program with projects focused on TDS, heavy metals and colour reductions. Key achievements for the program to date include:

- Over 600 ML of potential water savings identified;
- 175 Tonnes of associated energy savings; and
- 500 Tonne of TDS savings.

The cleaner production program allowed SEWL to go beyond trade waste discharge compliance and assist companies to understand the true environmental impact of their operations. As the projects developed, SEWL were able to identify synergies between companies. This program, combined with the information supplied in the WaterMaps has enable SEWL to develop a number of opportunities.

Industrial water transfer

A greater understanding of the quality of different process stream qualities has seen the development of SEWL's Industrial Water Transfer Strategy. SEWL has been able to identify 6 key industrial clusters where there are opportunities for relatively clean industrial water to be collected and used by a neighbouring company. Potential processes uses include:

- Cooling towers;
- Equipment wash down;
- Irrigation;
- Dust suppression; and
- Non-edible products.

Close to 400 ML of neighbour to neighbour water sharing has been identified for further development.

CONCLUSION

The management of Trade Waste results in industrial customers being regularly visited by a Trade Waste Officer. In order to understand the risks to the treatment system, SEWL works with the customer to understand the waste discharged to the sewer. This understanding is allowing SEWL to identify opportunities and facilitate companies to work together.

The concept of industrial ecology is opening up opportunities at SEWL to increase the coverage of the cleaner production program. The program is allowing SEWL to provide an innovative approach to companies to reduce their environmental footprint.

While the outcomes of the initial Port Melbourne study have not been implemented, primarily due to the high capital costs, it has created an opportunity for these companies to meet and discuss other possibilities. This has also become a template for future industrial ecology working groups.

The cleaner production program is now in its third year. The close engagement with customers is allowing SEWL to not only improve trade waste discharges but allow reduction in potable water use.

A greater understanding of the trade waste discharged by customers is also resulting in clear process streams being isolated opening up greater opportunties for reuse.

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