SPINDEX INDUSTRIES LTD. (Singapore)

ABOUT THE COMPANY

Founded in 1981 as a one-man, one-machine company, Spindex Industries Ltd. has grown into a regional group with subsidiaries in Malaysia and China. The Group employs 450 staff, with 150 at the Singapore plant. Spindex produces precision-machined components and sub-assemblies. These are used in a diverse range of office automation products, computer peripherals, consumer electronics, medical equipment, domestic appliances and automotive and telecommunication applications.

Spindex started its environmental protection work in the early 1990's by developing an unique immersion and spray system to eliminate Ozone Depleting Substances (ODS) from the degreasing process for precision-machined parts. Success in ODS elimination spurred the company to institute a formal system to continually improve its environmental performance to meet the business expectations of clients. It attained ISO 14001 certification in August 1998 — the first company in the precision machining industry in Singapore to do so.

WHY GP

DEMONSTRATION

As there are many SMEs in the precision machining sector, compliance levels are generally low and the industry has many significant environmental impacts, in terms of resource use and pollution impacts. Spindex therefore aimed to minimize these impacts and also to integrate GP methodology into its existing environmental management system to demonstrate GP as a tool for continuing improvement. Subsequently it hoped to disseminate its findings to other industries and to encourage them to adopt GP methodology.

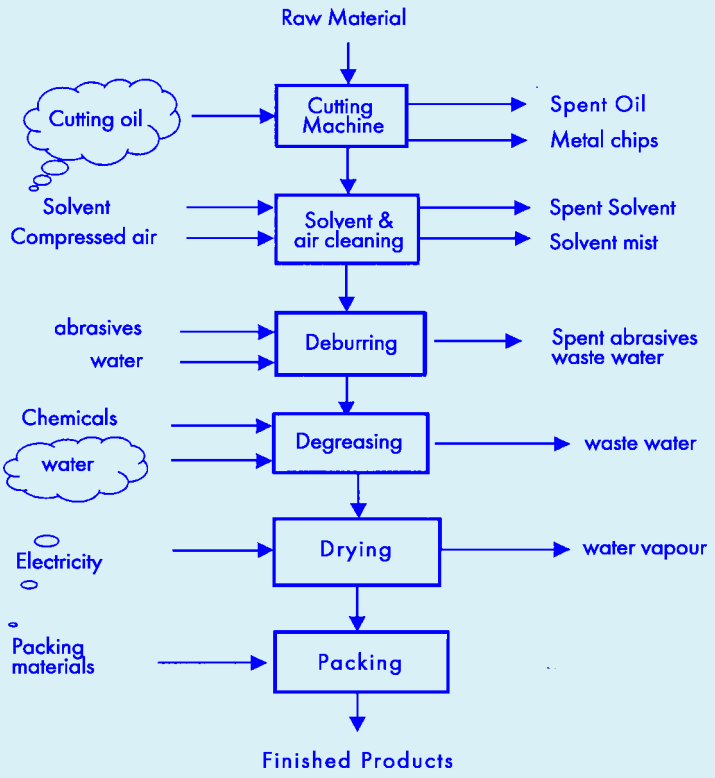
COST SAVINGS

Before embarking on GP, Spindex was already actively looking for opportunities to improve its environmental performance and had embarked on the implementation of an environmental management system. During this process, Spindex invested in an S$ 100,000 (US$ 57,200) waste water treatment system. The

company also invested in the services of a licensed waste disposal contractor for disposal of toxic waste like spent oil etc. Given this past investment, the company decided to implement GP to harness its production improvement potential and so turn environmental initiatives into cost savings rather than expenses.

To implement GP, the company used the methodology described in the introductory chapter.

Fig. 1: Process Flow Chart of Machined Parts



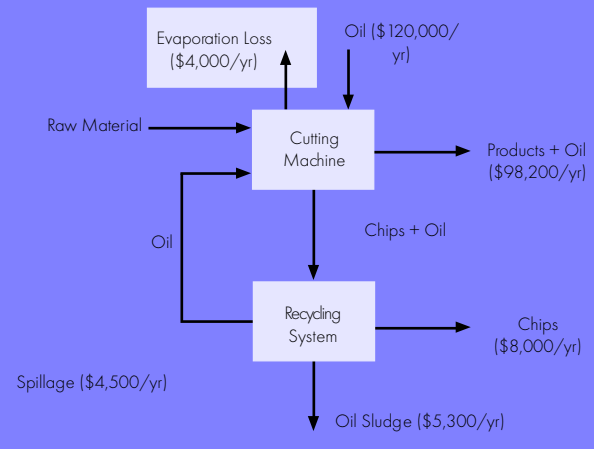
MAIN ISSUES

Spindex's manufacturing process (see Fig. 1) involves the machining of base materials such as free cutting steel and secondary finishing treatments such as grinding / deburring. Semi-finished components are degreased, dried and packed. An analysis of this process showed that, although the company had implemented a number of effective resource and waste management practices, many significant issues — both in terms of resource use and pollution generation — still persisted.

Major resource use issues included metal / alloy base material, electricity, cutting fluids, coolants, hydraulic oil, degreasing chemicals, packaging materials and water (both city water and de-ionized (DI) water). Major pollution-related issues included scrap metal, oil mist, spent oil and coolants, grinding sludge, waste water, oil spillage and volatile organic compound (VOC) emissions.

The process review showed that of these problems, cutting oil loss was key. Significant quantities of cutting oil were used in Spindex's machining operations to compensate for various losses in the system. Nearly S$ 10,000 worth of cutting oil had to be topped into the system every month. As many oil waste minimization programs were already in place, the GP project team undertook a detailed study to determine the cause of this problem.

Fig. 2: COST BALANCE FOR CUTTING OIL



Using tools such as site audits, a material balance and cost balance (see Fig. 2), the GP team identified that 85% of oil loss was due to product drag-out. It was found that each year S$ 98,200 (US$ 56,170) worth of cutting oil was wasted. This was a surprise to Spindex's staff who, before the review, had thought that most of the loss was with metal scraps. It was found that oil was also lost through spillage, as oil sludge from the plant's oil recovery system, along with metal waste and through evaporation.

Other key environmental issues included water loss and VOC emissions. Spent city water and DI water rinses are discharged

to the waste water treatment plant. Kerosene is used to clean the metal parts in the washing area, which results in high VOC emissions.

GP SOLUTIONS & IMPLEMENTATION

Various GP options were suggested and feasibility studies were undertaken. As drag-out loss accounted for such a high percentage of oil loss, high priority was attached to oil recovery from this area. The GP team brainstormed strategies for recovering oil from short components less than 150 mm in length (eg. pin slots) and from larger components (eg. printer shafts).

For the smaller components, it was found that the main problem was inadequate draining facilities immediately after the cutting process. To rectify this, an additional oil collection tray was installed and parts were allowed to drain for a least an hour.

For larger components it was found that drainage wasn't sufficient to remove all the oil. A number of options were developed to deal with this, the most effective of which was the installation of an oil seal in the cutting machine to wipe off the drag-out oil. Tests conducted revealed that this could reduce drag-out loss by more than 40%.

Loss of oil with the sludge from the oil recovery system (which is essentially a sedimentation unit) was addressed by reducing the frequency of the sludge cleaning from once a week to once a month. Higher retention time improves oil removal from sludge due to the effect of hydrostatic pressure.

Waste water losses were addressed by recycling spent DI water (used to clean printer shafts) within the rinsing cycle. VOC emissions were reduced by fitting an end-of-pipe treatment unit comprising a demister, with an exhaust fan system for removing kerosene droplets.

GP BENEFITS

The implementation of GP solutions in the Spindex production process brought a number of significant environmental and economic benefits.

The new drag-out minimization facilities resulted in appreciable savings in the amount of cutting oil used (estimated to be over 40% for larger parts and over 10% for smaller parts). The improvements also resulted in less oil sludge generation and a reduction in the VOC problem at the kerosene wash

CUTTING FLUID CONSERVATION

The cost of the GP option to minimize oil loss from small parts was S$ 60 (US$ 34) for the 30 plastic trays. This generated savings of S$ 5,460 / year (US$ 3,123). This translates into a payback period of just four days.

Modifications to the oil-recovery system management resulted in a saving of about 100 litres of oil per month. No capital investment was necessary and money was saved on manpower (S$ 1,440 / yr (US$ 823 / yr)), materials (S$ 4,200 / yr (US$ 2,402 / yr)) and waste disposal (S$ 210 / yr (US$ 120 / yr)). This gave a total saving of S$ 5,850 / yr (US$ 3,345 / yr).

WATER CONSERVATION

Water recycling measures saved about 600 litres of DI water everyday and reduced waste water generation by the same amount. This gave economic savings of about S$ 432 / year (US$ 247 / year).

VOC REDUCTION

The demister system reduced VOC concentration appreciably — from 15.73 ppm to 5.54 ppm, so improving the working environment.

OIL STAIN REDUCTION

Epoxy flooring was laid to eliminate oil stains and minimize soil contamination.

CONCLUSION

By applying GP methodology, the company has been able to identify new areas of environmental improvement, while maintaining its core focus on quality. It also helped the company to focus its attention on the most important problem areas. Before a material balance was used, the company had been focusing on recovering oil from waste chips. However the material balance clearly indicated that drag out along with products was the key problem area. This helped the company to focus its attention where it would be most effective.

GP methodology has now been integrated into Spindex's ISO 14001 Environmental Management System. The GP methodology was helpful in identifying new objectives, targets and programs for the existing EMS. GP has contributed significantly to the process of continual improvement and Spindex is now studying new aspects like energy conservation.

The various GP measures implemented have not only improved the image of the company, but also helped the company attract talented employees who were initially avoiding the precision machining industries due to its unclean working environment. This is a major intangible benefit the company derives from the improvements it has made to its environmental performance.

"We achieved tangible benefits in areas such as cutting oil recovery and water conservation.

But the main achievement of this GP demonstration project is that it has helped to change the image of Spindex. This has meant that we are now more easily able to attract young and talented people to join our industry."

Mr Choo Heng Thong
Managing Director
Spindex Industries Ltd

It is hoped that this demonstration project will help disseminate evidence of the effectiveness of the GP concept and methodology to other companies in Singapore. In this way, APO and PSB aim to initiate a new era of productivity improvement and environmental protection for Singapore's industry.

Video available for this case study from:

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