A multi-site approach towards integrating environmental management in the wine production industry

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Abstract

Nine wineries and a water bottling plant situated in the Franschhoek Valley, South Africa, have decided to lead the way towards creating a safer and more sustainable environment in the Valley. As part of the Vignerons de Franschhoek ECO Association (VFEA), they adopted a multi-site approach and obtained, in December 2003, the first ISO 14001 multi-site certification in South Africa. This proactive approach allows them better overall environmental performances through mutual motivation, information sharing and comparison of practices by the different participating organisations of the Valley.

At the initiation of the project, the major concerns were associated with a lack of sound environmental management and training of employees. Of particular concern was also the lack of monitoring and measurement of environmental performance key indicators, especially in water consumption and wastewater disposal areas. Although the system is still in its juvenile stage, it already showed some effluent quality improvements through better wastewater management, better control over chemical stores as well as definite improvement in water management and increase in solid wastes recycling. The latter improvements will definitely entail long term cost savings should the system be continually and properly maintained.

It is the intention of the VFEA to create a more environmentally friendly Valley by convincing others to be more environmentally responsive and expanding the ISO 14001 principles to other areas of the organisations including the farms, to other wineries and ultimately to the whole Franschhoek Valley.

Keywords: Eco Association, Environment Management System, Franschhoek Valley, environmental performance

Introduction

Today's competitive market in concert with more stringent legislations require companies to be more environmentally friendly than your competitors whilst remaining cost-effective, efficient and delivering products/services of a high quality standard. Current South African legislation, i.e. National Environmental Management Act 107 of 1998 and Environmental Impact Assessment Regulations, insists on the need for a company to have a structured approach or strategy in place to reduce the environmental impacts of its activities, services and products. The wine industry is no exception in this respect and faces a challenge regarded as a potential hurdle in the continuation of their practices. The development of an effective Environmental Management Strategy/System (EMS), i.e. ISO 14001, has therefore been identified as one of numerous tools to assist in meeting the above requirement.

The Western Cape in South Africa is known internationally for its winemaking activities and its scenic vineyard landscapes. Less obvious, however, is the amount of wastes generated during the processing of grape into its nobler form, known as wine. The project was conceptualised after the Rupert and Rothschild Winery in the Valley had been awarded the first ISO14001 certification in South Africa. At the certificate presentation function, Dr Anton Rupert commented that it would be ideal if the entire Franschhoek Valley became ISO 14001 compliant. Subsequently, the two other Rupert wineries, L'Ormarins and La Motte, also went through the ISO 14001 certification process and the course was set for the first ISO 14001 multi-site certification of this type in South Africa! Nine wineries and a water bottling plant situated within a radius of 30km in the Franschhoek Valley decided as a group (Eco Association) to tackle this challenge together heading towards a friendlier environment and a more sustainable future. As part of the Eco Association are Agusta Wines, Boekenhoutskloof, Boschendal, La Couronne, La Vie de Luc, Mont Rochelle, Moreson, Stony Brook, Rickety Bridge and Vrede en Lust.

Multi-site approach towards EMS implementation within the same company is nowadays more common, however the alliance of independent organisations in taking the route towards a more sustainable environment in the Valley made it a unique approach as each company reveals a peculiar management structure and style. In partnership with regulatory authorities, this proactive approach allows distinguished overall environmental performances through mutual motivation, information sharing and comparison of practices by the different participating organisations of the Valley.

Heading towards better environmental performance

The figure on the next page depicts the status of the Eco Association environmental commitment before the EMS implementation commenced.

The following were identified as particular concerns at initiation of the project:

- The lack of management awareness and understanding of the environmental impacts of their activities:

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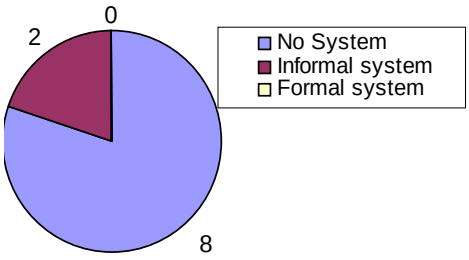

- The tremendous lack of staff awareness on environmental issues
- The ignorance of relevant legal and other requirements (especially irrigation limits for winery activities); and
- The lack of monitoring and measurement of environmental performance key indicators.

The first and most prominent feature of increasing environmental performance in any company or industry is that it should be a priority, and that it should be managed like any other aspect of business. Environmental strategies should be integrated into all aspects of the business/production process (Bezuidenhout et al., 2000). A written environmental policy firstly allowed each member of the Eco Association to outline their vision and commitment to the environment. In line with the adopted policy, participants then jointly and collaboratively defined priorities and objectives to reduce the environmental impact arising from the most significant aspects associated with their practices. Achieving these objectives involves continual control of the production process by means of education/training, monitoring and overall cleaner production practices.

This initial exercise in defining an environmental management program allowed all of them to better understand the direct and indirect impact their activities can have on the environment and required them to consider legal requirements associated with each identified aspect. A close collaboration with the Department of Water Affairs facilitated the journey of each member towards compliance through smoother flow of information and assistance in planning, scheduling and interpretation of requirements from regulatory bodies. A win-win situation arose from the latter cooperation as a feeling of familiarity developed rather than the well known association of legal authorities as "hunters for compliance". Due to the lack of monitoring and measurement for most of the participants, the need for the creation of a benchmark was directly identified. Monitoring of the significant environmental aspects and impacts forms the foundation of any EMS as it constitutes a continuous measure of one's environmental performance through the identification of Key Performance Indicators (KPIs). It allows the establishment of benchmarks for future improvement in environmental performance, the identification of legal non-compliance and the prevention of environmental incidents as staff are more aware of the environmental impact their actions can have.

The most significant aspects identified for the wineries are the disposal of effluent, consumption of water and electricity, solid waste management and emergency preparedness. For the water bottling plant, the water consumption, emergency preparedness and segregation and disposal of packaging waste was identified as a concern.

"With regard to monitoring of key indicators, the water usage and effluent quality monitoring have proved of good value and are certainly the two most important impacts for a cellar of our size" quotes Nigel McNaught, Winemaker from Stony Brook.

Figure 1a and b depicts a summary of the Eco Association status respectively before and after the implementation of the EMS. A definite improvement in the identified significant aspects is noticeable; however, room for further improvement is possible as would be discussed in the article.

The Eco Association has also conveyed the message of being environmental friendly to subcontractors and suppliers by sending out information letters demonstrating its commitment to the environment and referring to legislative requirements to comply with.

Water management

Water usage in South Africa is of particular concern in times where there is potential water shortage due to drought. The need for monitoring water consumption therefore became obvious for all participants. Since values for 2002 were not consistent and many members had not yet installed water meters, only readings from 2003 were considered to form a benchmark for future performance evaluation.

The following water saving practices have been put in place at most of the participant's organisation since the beginning of the project and should prove to be efficient in reducing water consumption during the 2004 harvest season:

- Installation of a water meter – allows to track water use performance, help to identify leaks or need of maintenance and set up objectives for water reduction
- Use of high-pressure water – more effective cleaning of sur-

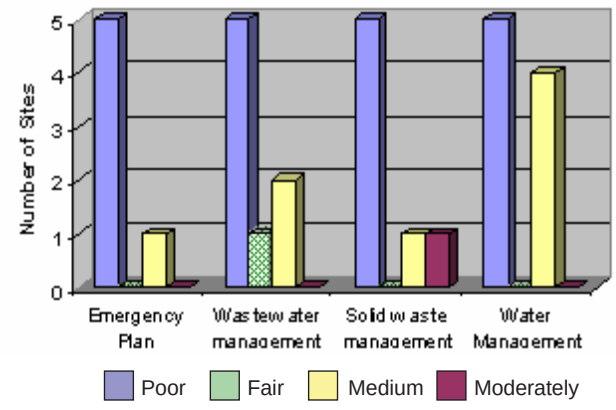

Figure 1a
Management status of the Eco Association before implementation of an EMS

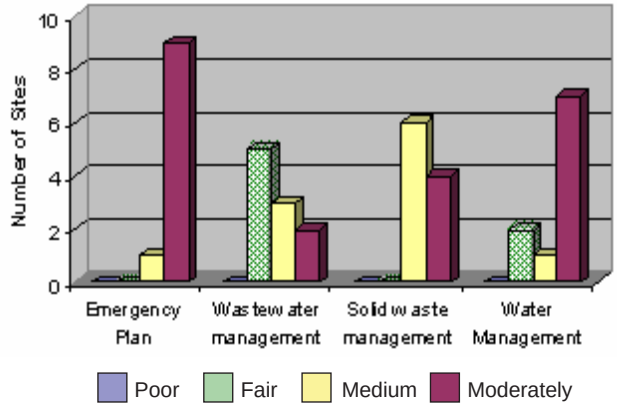

Figure 1b
Management status of the Eco Association after implementation of an EMS

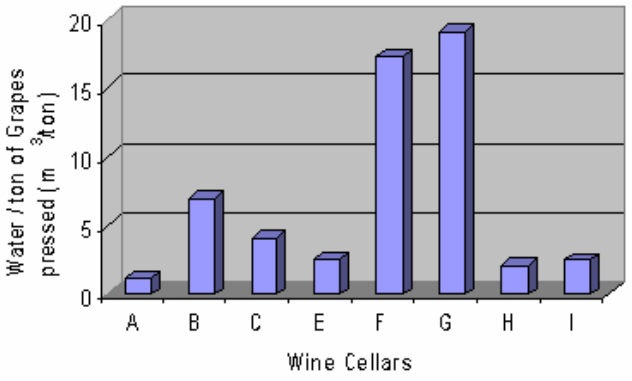

Figure 2
Total water consumption per ton of grapes pressed for the year 2003

faces and low water volume required
- Use of steam cleaning for some cellars
- Use of nozzles – avoid wastage of water
- Dry sweeping of floors before using water and use of brushes when cleaning floor
- Reusing of cleaning/sanitising solution during equipment washing, and
- Sparingly use of water when cleaning equipment and floor – achieved through staff awareness.

Some members already had a few of the aforementioned practices in place; however none of them could claim a high efficiency water management program before implementation of the EMS.

Two participants were omitted from the comparative water consumption graph (Fig. 2) due to faulty water meter readings and delayed installation of the water meter. All of these values are situated at the bottom range of the average water consumption for South African cellars, lying between 1.5 and 6 m^3/ton. Two of the cellars (F, G) however lie well above the average. These values clearly indicated other uses of water such as houses/restaurants/gardens.

"Since the beginning of the Eco association we have come a long way regarding water saving and getting the right attitude towards effluent management" quotes Francois Conradie, winemaker from Boschendal.

Comparing water consumption between cellars can be erroneous as it will greatly depend on various parameters such as type of tanks, processing equipments, etc; and can therefore only be used as an indication of a trend. Moreover, assessing water consumption improvement for a member can also be mistaken as it will depend on the productivity level; if not at full production, water consumption per ton of grape will be higher than expected. The latter will have to be considered for upcoming evaluations.

Wastewater management

Irrigation of wastewater is currently the preferred method of disposal in the South African wine industry and is acceptable, providing irrigation is monitored, done beyond 100m from a natural water resource and it complies with the following legal requirements for General Authorisation for Irrigation (Table 1). Irrigation is also prohibited during rainy season as to avoid water logging.

In order to receive ISO 14001 certification, five of the cellars had to compile a wastewater/effluent management plan (EMP) as irrigation/disposal of effluent was carried out onto land within 100 m of a natural water resource, therefore not complying with the General Authorisation requirements. The close collaboration with the Department of Water Affairs (DWAF) definitively facilitated the process that might have otherwise been fastidious. All concerned members received written authorisation from DWAF to manage their effluent in accordance with the submitted EMP's.

TABLE 1
Legislative requirements (DWAF) of wastewater when utilised for irrigation

Parameter	Less than 50 m^3/d	Less than 50 m^3/d
Electrical conductivity	< 200 mS/m	< 200 mS/m
Chemical Oxygen Demand (COD)	5 000 mg/ℓ	400 mg/ℓ
pH	6.0 – 9.0	6.0 – 9.0
Sodium Adsorption Ratio (SAR)	< 5	< 5
Faecal Coliforms	< 100 000 CFU per 100 mℓ	< 100 000 CFU per 100 mℓ

Cellars have a year round output of effluent, mostly as a result of the various washing and cleaning operations associated with vinification. The bulk of the wastewater, generally more than 50%, is created during the harvest period. Due to the nature of vinification (essentially batch processing) the pollution load of the wastewater may exhibit significant variations, both on "short term" daily and seasonal "time frame" as well as a significant amount of solid waste (Bezuidenhout et al., 2000). The legislative requirements will therefore be initially used as benchmarks for the measurement of effluent quality.

Although the cellars' effluent quality regularly complied with abovementioned regulations, figures 3a, b and c indicate a large variance in the production processes/practices utilised in the wine industry in general, as well as the absence of best practice guidelines. This definitely leaves "room for improvement" by implementation of relatively simple process adaptations and principles (Bezuidenhout et al., 2000). It has also been noticed that sampling methodology was not always adequate and consistent for some cellars neither closely adhered to, leading to potential misinterpretation of results. In general, a grab sample can be taken if effluent is stored for more than 24 hours but if it is stored for less than 24 hours, a composite sample must be taken (Winetech Report, 2004). "This has been the singularly most successful aspect in the entire plan and we aim to continue with implementation and look for areas where we can improve" quotes Nigel McNaught from Stony Brook.

For most of the cellars however, Figs 3a, b and c document some improvement in effluent results following the implementation of set targets:
- Awareness training of staff regarding solids separation from effluent
- Installation of mesh/screen on effluent drains to retain solid wastes
- Bunding of washing area where applicable
- Move component washing away from storm water
- Recycling of lees and careful draining of tanks before washing with water
- Dry sweeping before using water, etc.

Low pH values are easily rectified by the addition of lime before the

effluent is irrigated whilst effluent from cellar A is treated by the municipality which has no specific quality requirements. By avoiding prolonged contact between skins/pips and effluent, one can drastically decrease COD, conductivity and SAR levels. Although there are no legal limits for SS, it does also influence the COD and should generally be kept to a minimum.

Cellar C should be below the first upper limit of 400 mg COD/l but the average for both years, 2002 and 2003, exceeds this limit by far. Although this is a serious problem, the cellar is investigating a new effluent management plan in conjunction with DWAF and various subcontractors to ensure full compliance to legal requirements.

Separation of storm water and wastewater has also been a definite improvement in water management as it does not only decrease the volume of wastewater to be treated but also ensures that storm water remains unpolluted.

Some cellars have also decided to move towards more environmentally friendly cleaning chemicals directly improving on released effluent quality. One of the members is also investigating the sole use of steam for cleaning and sanitising of processing equipment. Most of the members are considering the monitoring of chemical usage as a good management practice rather than a key indicator for environmental performance, although reusing washing solution for example could prove a decrease in chemical usage and release into the effluent. Chemical store management has definitely improved over the past year as all members now have a dedicated store room locked at all time and adequately controlled through update of stock cards.

Energy management

Figure 4 illustrates electricity consumptions for all members. As for water usage, 2003 readings will be used for some as benchmarks for subsequent years. However, readings for participants A, E, F, G and I also include electricity consumption from offices, restaurant, etc. A proper benchmark is therefore still necessary for the latter members. For the water bottling plant, the total electricity consumption from 2003 (56.82 kWh/m^3 water produced) will be used as a benchmark for future performance evaluation.

Electricity usage is kept at a minimum through the following actions:

- Switching cooling off during winter and doing cold stabilisation in winter rather than summer
- Switching appliances and lights off when not in use
- Awareness of staff overuse of power

Solid waste management

Along with the awareness of the impacts that solid wastes originating from cellar practices (skins, pips, stalks and filtration media) can have on the environment, half of the members already implemented a “composting” site facility whilst other members are investigating it. However, most of those established dedicated solid waste areas must still be lined at the bottom and have a proper leachate collection system if applicable or else be completely enclosed.

Lees is collected separately and sent to a recycling company for tartrate recovery. Lees recovery has only been implemented recently at 7 of the sites, leading to a significant improvement in wastewater management whilst 2 of the

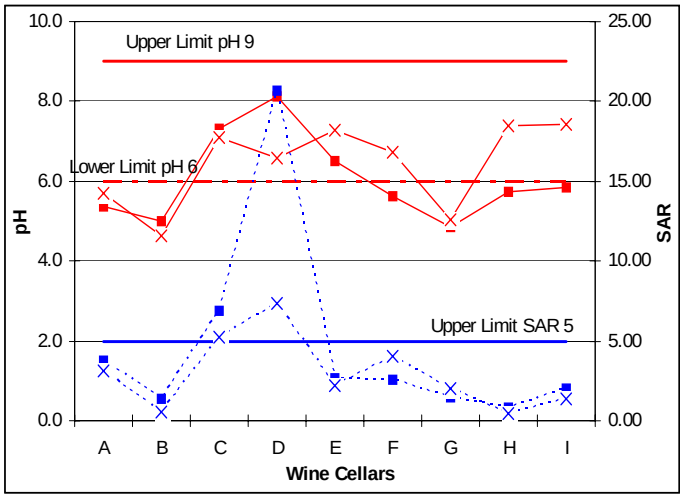

Figure 3a
pH (—) and SAR (----) values for 2002 (■) and 2003 (x)

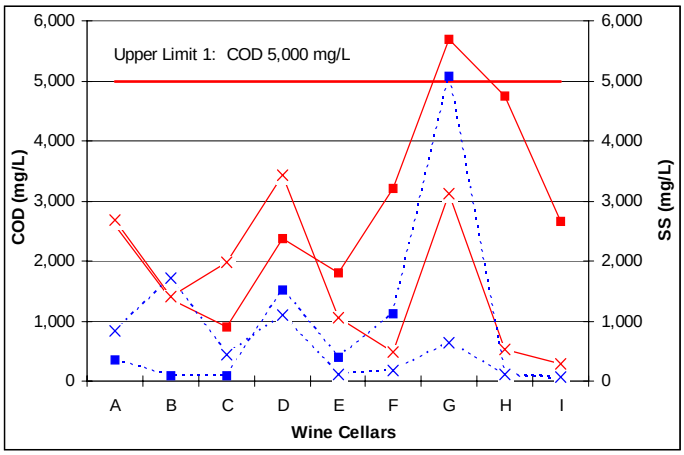

Figure 3b
COD (—) and SS (---) values for 2002 (■) and 2003 (x)

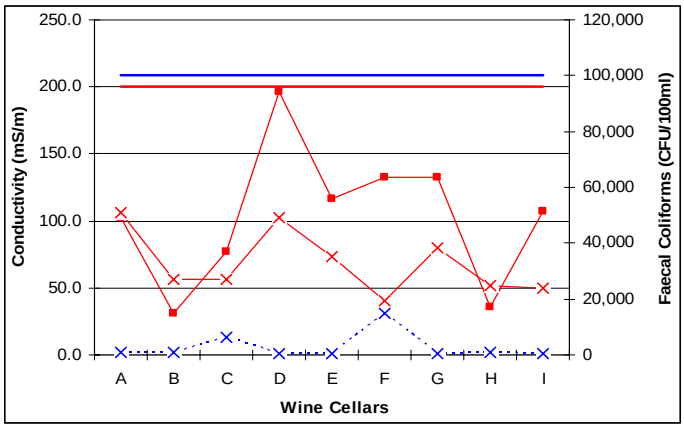

Figure 3c
Conductivity (—) and faecal coliforms (---) values for 2002 (■) and 2003 (x)

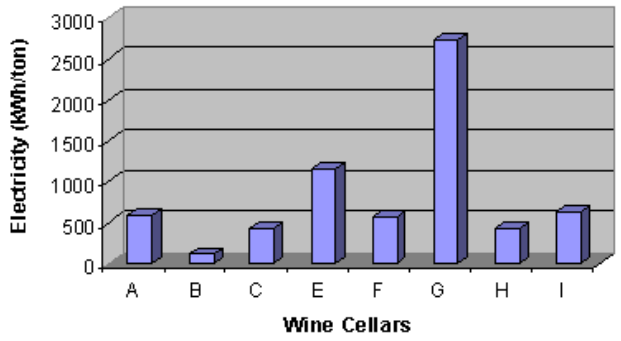

Figure 4
Total electricity consumption per ton of grapes processed for the year 2003

members were already recycling their lees before the EMS implementation started. Non negligible for small size cellars, lees recycling also constitutes a small source of income.

"As lees recovery continues to be a revelation, it is probably one of the most important initiatives undertaken in the South African wine industry to date" quotes Nigel McNaught from Stony Brook.

Recycling and segregation of normal wastes such as cartons, glass and papers has brought to all a new dimension in the conservation of natural resources and minimisation of solid wastes generation. Collection of wastes however remains a challenge for most of the members as subcontractors, willing to collect small quantities of wastes, are scarce. Some faced the unfortunate situation where waste was segregated on the premises just to be thrown together at collection. Where applicable, most of the members are now also using recyclable cartons, requiring from their subcontractors to follow their steps towards conserving natural resources.

Carton, plastic and pallet management constitutes a major aspect at the water bottling facility. The implementation of segregation and recycling of the latter through staff training during 2003 has been a major environmental performance improvement.

Emergency preparedness

Emergency preparedness was also identified as a major aspect as none of the members, besides one, had an emergency plan in place in case of an incident (environmental or health and safety). At present, all members have an emergency plan in place, taking into consideration accidental release of effluent and chemical spills where applicable as well as fire and first aid. Moreover, evacuation and mock drills have been exercised at all facilities prior to certification and will be repeated annually. As part of the emergency preparedness, all members obtained Material Safety Data Sheets but not with ease.

"In-house training in both safety and environmental aspects are handled by the SHE manager and monthly talks are given" quotes Francois Conradie, Winemaker from Boschendal.

Training

Staff awareness training has been carried out annually at each site and has helped the organisations to gear up into the right track towards minimising environmental impacts arising from significant aspects. It allowed developing a workforce that is beginning to be aware of and concerned about the environment and its associated problems and which is in the process of acquiring the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new impact/incidents.

"It also gives the semi skilled and unskilled workers on the farm the opportunity to understand the importance of our natural environment and to expand their knowledge by attending appropriate short courses on environmentally related subjects applicable to their work on the farm and in the cellar" Dominic Burke, Winemaker from La Couronne.

Eight of the 10 members attended an ISO 14001 internal auditor training during the course of 2003, equipping themselves with knowledge and skill to audit the EMS system in place at their premises and also broadening their understanding of ISO 14001. It is hoped that the other members will follow their example. This will enable a very efficient network of internal auditing, whereby the Eco Association can function unaided while strengthening communication between members.

Hurdles during implementation

The novelty of implementing ISO 14001 on a multi site, along with the seasonal activities in cellars, brought along many hidden constraints.

A few major concerns at initiation of the project were the:

- lack of data management and capturing ability
- lack of resources
- financial constraints
- lack of effective communication and
- lack of supported structures to enable improving environmental performance

The divergence in management structure and practices/views also slowed down the implementation process as the acceptance of new ideas and processes often remains a difficulty for an established organisation. However, determination and motivation from the participants allowed the project to be successful.

Conclusions

Environmental awareness and the paradigm shift required take a while to set in but we are confident that the system has a solid base leaving room for continual improvement. The multi-site approach chosen by the Eco Association lead to definite enhanced communication and motivation between participants. The Integration of the EMS into daily management practices allowed wineries basic control over processes as well as activities which might have environmental impact and which were previously not formally managed.

"On a collaborative note, this acknowledgment has allowed the Franschhoek Valley a unique advantage over other wine growing regions as being the first South African wine production region to be granted such an accolade, which can also benefit the region from a marketing point of view" quotes Dominic Burke from La Couronne. A major success of this project was the introduction of a monitoring program which enabled organisation management and employees to become more aware of the environmental impact of their activities, therefore reducing the potential occurrence of incidents that can have an adverse effect on the environment. Moreover, sound environmental management decisions can only be based on reliable records retrieved from consistent monitoring. The environmental performance is, at this stage, still difficult to determine since monitoring of some key characteristics have not been done consistently although benchmark values have been established for future

evaluation. However, a definite improvement in the management of significant environmental aspects was achieved, i.e. improved water, wastewater and solid wastes management, enhanced chemical store control, better awareness of all staff and updated emergency preparedness.

The Eco Association still continues to involve DWAF intimately with the project, working together towards long-term solutions and continual legal compliance. Through this inclusion, the commitment of the Eco Association to continually improve becomes evident.

"I feel that we now have a cleaner, safer and more cost effective working environment on the farm. The effluent that we irrigate is analysed monthly and any faults found with the effluent quality are rectified before irrigation. The water and electricity management is 100% better now than it was before the implementation of an EMS. There is also markedly less wastage and more awareness of our working surroundings. The financial benefits are minimal at present, but I feel that with continued use of the system, we will certainly see the benefits" says Mary Hoy, the Eco Association Environmental Management Representative.

"The ultimate goal in the valley is to have all wineries and later other industries and businesses coming on board and keeping our valley in the best possible environmental condition," says Franschhoek Wine Valley CEO Jo Sinfield.

FUTURE IMPROVEMENTS

As part of continual improvement, the key principle of ISO 14001, the ECO Association constantly review its environmental impacts and grab opportunities to improve its environmental performance through various potential projects.

The following problems and deviations are under investigation and will hopefully be solved within the year 2004:

- Methodology in effluent sampling,
- Monitoring of irrigated effluent quantity as to comply with legislative requirements,
- The installation of an independent cellar electricity meter as to display more accurate readings and to create proper benchmark and
- Effluent treatment plants under development for cellars that require one.

Future environmental projects such as communal disposal/waste collection sites for recycling wastes and composting sites have been identified, since most of the members struggle with these areas. Further improvement could also be achieved in energy management (environmental and financial), both on managing the demand and through alternative energy suppliers. This will be investigated at a later stage.

Some members are currently investigating recycling of chemicals packaging as they are now triple rinsed and punctured before disposal in a landfill site. An improvement that can be tackled by the water bottling plant is the adoption of an alternative way of distribution – optimisation of packaging format (5 ℓ instead of 500 mℓ, etc.) as well as better consumer awareness on product packaging recyclability.

The vision of the Eco Association lies in extending the ISO 14001 principles to the vineyards and convincing others to be environmentally responsive and creating a more sustainable Valley. The latter would also involve minimising the impact of social problems such as poverty on the natural environment (correct wastes handling and disposal, creation of jobs, income to uplift and educate people). However, changes towards this vision will have to be incremental and acceptable to people before it can effectively be implemented.

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