seed cut-over valves on the pan floor were not inspected and serviced during the off crop, as would normally be done, because no problems had been encountered during the previous season. However, due to one valve failure during the new season, different grades of seed were mixed, resulting in a poor quality of massecuite. As the batch centrifugals could not cure this massecuite, a supposedly minor issue resulted in an extended factory stop and the supposed maintenance savings achieved during the off crop were lost in just one day.

- Undetermined loss is sensitive to LTA. The longer the plant stops, the bigger the increase in UDL. In this case, it is not only the standing cost that is incurred, but also the cost of UDL as shown in a previous section. Although this is a once-off type of problem, and related costs may be negligible, other different problems in a factory may prove very costly. Cost-cutting exercises needs a thorough review and must be implemented across all disciplines.

Conclusion and Recommendations

A vicious cycle can be easily created in any organisation. It is not necessarily the result of ignorance, recklessness, incompetence or a lack of experience, but instead may even result from the best intentions. Breaking the cycle is often difficult and may take time. Sometimes it takes someone from outside the factory to identify the root cause of the cycle or the main source of a problem, and this can be embarrassing to those involved internally.

Some vicious cycles go unnoticed and end up costing the organisation substantially. Sometimes modifications or even capital projects are carried out to break the cycles, but only by treating the symptoms of the problem without resolving the root cause. This can result in the well-known phenomenon of a "white elephant" in the factory, which refers to a piece of equipment that was installed but didn't work to solve the problem it was intended to address. Vicious cycles are the parents of some, but not all, of these "white elephants". In such cases, the route cause is only finally addressed after other, unsuccessful, remedial actions are taken.

The first step in breaking a vicious cycle is to correctly identify the problem by conducting a root cause analysis. This may be time-consuming but will provide a more informed technical solution. Experience and attention to detail, including detecting factory problems at an early stage before the cycle of problems begins, provide faster and more robust solutions. It is imperative to pay attention to details.

Engineers need to understand their plant sections thoroughly and understand all failures and problems. During the good times, it is important to understand why the plant and equipment are running well, as this information will be helpful in bad times. As much as it is good to implement new initiatives, an open and thorough analysis must be conducted initially to cover all bases. A HAZOP study is one tool that can be utilised in such instances.

Acknowledgments

The author would firstly like to thank Steve Peacock for assistance and guidance. The encouragement and input from Tongaat Hulett Operations Support staff is acknowledged. The author would also like to especially thank all process engineers from Tongaat Hulett Sugar, and outside. All the information provided, and the transparency, is greatly appreciated.