



RICE CRC
FINAL RESEARCH REPORT

P4201FR06/05

ISBN 1 876903 19 8

Title of Project :	Development of Rice Milling In-Line Process Control
Project Reference number :	4201
Research Organisation Name :	Ricegrower's Co-operative Limited
Principal Investigator Details :	Project Engineer
Name :	Mr Owen Hennieke
Address :	Yanco Ave, Leeton NSW 2705
Telephone contact :	02-6953 0569

TABLE OF CONTENTS

1. Background	1
2. Objectives	1
Continuous Improvement Systems	1
Process control systems	1
3. Methodology	2
4. Results	2
Milling Yield Improvement.....	2
On-Line Measurement	3
5. Outcomes	4
6. Recommendations	4

1. Background

SunRice's Milling facilities were for the most part designed and built before the widespread use of computer based (Programmable Logic Controller or PLC) control systems. Over the years, PLC systems were introduced into the mills to improve the level of automation and reliability of process control. However, these systems did not incorporate all of the process control possibilities available.

SunRice also required a more consistent and modern methodology to the human side of process improvement in general.

2. Objectives

The objective of this project was to better take advantage of the opportunities offered by modern systems. There are two main areas to the project:

Continuous Improvement Systems

The objective was to implement a process improvement methodology that could apply across the business. The methodology needed to be systematic, effective, fact based and process oriented.

Process control systems

The objective of this area of the project was the development of automated systems to monitor and aid control of the rice milling process. This in turn is aimed at improving milling quality, quality repeatability and mill efficiency.

The areas of process control reviewed and where enhancements were made were:

- Computer control of the vertical milling process
- Moisture meter (Grainspec) automatic interface to mill control system (PLC).
- On-line Process Weighing system implementation in Leeton Mill and integrated web-based reporting system.

The first two items noted above were developed and reported upon early in the CRC scheme (refer to Rice CRC Annual Report 2000/2001, Program 4). This final report will focus on Continuous Improvement and On-Line Process Weighing.

3. Methodology

The Continuous Improvement System selected after research of the available options was Six Sigma. This is a process improvement methodology that is customer focused, team based and fact driven. It is a methodology that has been adopted by several world-leading companies, notably Motorola, General Electric and SONY.

The Six Sigma process was introduced to the business in stages, with the help of an external consultant expert in Six Sigma. During the pilot stage of approximately 6 months, leadership commitment was established, a core of staff were trained in the principles of Six Sigma, and a set of pilot projects were selected to test the methodology.

The pilot projects selected were as follows:

- Milling Yield (Leeton Mill huller losses)
- Paddy Drying (drying accuracy & losses)
- Packaging Improvements (film friction & performance)
- Supply Chain Claims (business process re-design)
- Procurement Review (business process review)

Stage 2 applied learning from the pilot projects, included an expanded training program. Approximately 150 staff were trained to a detailed level and a further 150 staff trained to an introductory level. An additional 25 process improvement projects were selected by the business for action using the Six Sigma methodology.

4. Results

The pilot Six Sigma projects are delivering significant benefits to SunRice and the Six Sigma approach to process improvement is being rolled out to all areas of the business. A very large training program was implemented with approximately 150 staff trained to a detailed level and a further 150 staff trained to an introductory level.

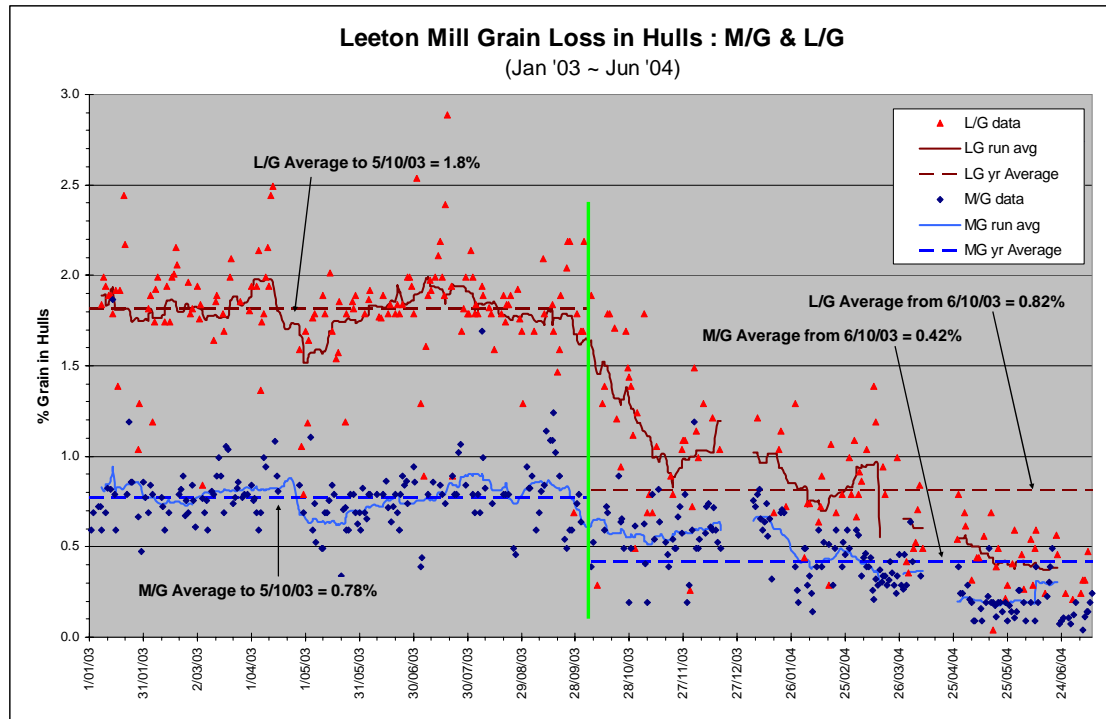
Milling Yield Improvement

Discussion of the Six-Sigma pilot projects will be confined to the Milling Yield project (Leeton Mill) as this is directly related to CRC project 4201.

This project successfully combined the teamwork and measurement aspects of the Six-Sigma approach to achieve significant reductions in whole grain rice losses due to inefficiencies in the hulling process.

Prior historical records indicated a typical grain loss of 0.78% (by weight of hulls, Medium Grain), and 1.8% for Long Grain. For the 9 months following the start of the Six Sigma investigation, the average loss figures reduced to 0.42% (MG) and 0.82% (LG) respectively. Refer to figure 1.

Figure 1: Leeton Mill Grain Losses via the Hulls Stream



In figure 1, the red data points (triangle) indicate Medium Grain data averaged over 3 shifts on a daily basis. Likewise, the blue data points (diamond) are for Long Grain. “Run avg” refers to the running average of the daily data (over 45 days). The bold vertical line at the beginning of October 2003 coincides with the commencement of the Six Sigma process investigation and implementation of the process changes.

The yield improvements were achieved without substantial capital investment, but rather by refocusing priorities in the milling process and increasing visibility of the mill performance in *real time*. This enables millers to make better informed and timelier decisions about process adjustments.

On-Line Measurement

The on-line weighing capability of Leeton Mill was substantially increased. Two process weighers were upgraded and a further seven installed under SunRice’s capital expenditure program. This has had the effect of increasing visibility of process performance, particularly process yields at various stages of the milling system. This was particularly useful in the Milling Yield improvement project.

Integrated real-time reporting tools were developed to enable mill production staff and management to make use of the information provided by the weighing system. This development work is ongoing, and is currently being moved to a web-based format.

5. Outcomes

The Six Sigma approach will be adopted by SunRice as a structured process improvement methodology, and will be applied to progressively more challenging process improvement initiatives.

On-line production measurement and yield analysis is being further developed at Leeton Mill, with the long term aim to build similar systems into the other mills.

Production volume decreases driven by external factors (prolonged low water availability) have slightly obscured the benefits of the control and monitoring improvements. However, when volumes again increase, these control initiatives will be an important part of maintaining peak milling efficiency.

6. Recommendations

SunRice will need to continue to work on ongoing development of mill control systems to offer best practice control over its production facilities. The process control developments made during the CRC program will be an important part of this ongoing development.