Case Study – Flow Metering & Data Acquisition System

Sunshine Dairy* looks to improve its profitability by using the very latest Flo-gineering flow metering and data acquisition system. The Company requested a survey evaluation be carried out and a financial analysis prepared.

Executive Summary

Industry
Typically used in farm milk collection operations. Also used for metering molasses for stock feed, and for measuring grey water collections.

Business Situation
Where measurement of liquids for the purpose of generating invoices is required, Flo-gineering has the only government certified measurement system.

Benefits

- Certified accuracy
- Reduces downtime
- Reduces manual data entry
- Hygienic sampling
- Eliminates need for weighing
- Integrated to plant processes
- CIP Monitoring

Product
Flo-gineering's Flow Metering & Data Acquisition solution using a wireless GPRS Modem.

Objectives of the Survey

The aim of this survey was to evaluate the existing milk collection and operational procedures carried out by a large Australian Dairy called Sunshine Dairy.

The survey aimed to determine the real cost savings achievable plus qualitative benefits that could be implementation of automated tanker-mounted sampling and data acquisition systems compared to manual dipstick measurement procedures, including weighbridge and data handling operations.

The four aims can be summarized as:
1. Document and compare the current operational versus the proposed automated system

2. Identify all probable qualitative benefits offered by an automated system

3. Measure all potential business process can be generated by the system

4. Investigate and compare the accuracy of the existing dipstick and weighbridge volumes against a flow-metering system.

*Sunshine Dairy is a ficticious name but the facts and results of this survey are real.

"Gone are the days when visual dip-stick methods of measurement offer acceptable variations. Our business and our clients require certified measurement results and the Flo-gineering system gives us that reliably and efficiently."

The Existing Business Situation

The factory has a fleet of 140 tankers running two shifts collecting milk from 1600 farms.

The fleet is exceptionally well maintained and an obvious pride in the fleet was clearly detectable. Many of the tankers were fitted with the latest dual pump systems that are capable of pumping 1,680 litres per minute (100,000 litres per hour).

Our survey required us to follow the data flow.

The run sheets were prepared each day by the Transport Management team and distributed to the individual driver's pigeon holes.

The driver picks up his run sheet/s for the day and commences the tour.

Upon arrival at each farm, the driver turns the agitator on and checks the temperature of the milk. We saw no example of any sensory test being conducted during our visit. The hose is connected to the VAT and the primer pump is initiated followed closely by the main centrifugal pump. The pumps operated at circa 1,000 litres per minute even when the VAT outlet was only 50mm.

At each farm, the driver records the actual volume collected on the run sheet (opposite the "estimated litres") and then on the farmer's wall chart (Daily Milk Record). The driver also records the temperature of the milk in each VAT[1]

The driver removes the hose and does a light wash of the VAT and surrounding area. The whole process is quite fast and streamlined.

At the end of the tour, the driver refuels, weighs the loaded vehicle and then tabulates the individual run sheets. He totals the actual litres collected, then he records the time, the length of the shift, the kilometres travelled, the loaded vehicle weight, the prime mover number, his name and the odometer reading.

The run sheet is handed into the Transport Office where it is then manually entered into MADCAP on the following day. Each run sheet is also reviewed by the Transport Manager each day. The Field Support personnel similarly check each run sheet for anomalies and produce an exception report for subsequent investigation[2].

The end of day data entered into MADCAP is then electronically transferred to Head Office. Lab results are sent the following day to Head Office and electronically merged with the MADCAP data. Results of the pickups are faxed daily to each farm (2,000 faxes a day are issued with 5% not successfully transmitted and a further 10% requiring hand distribution by the driver).

The administrative staff handle all queries from the farms as to inconsistencies between payments and litres written on the Daily Milk Chart.

After unloading the milk, the tankers are CIP washed without any data being recorded as to completeness of the wash.

The trucks are then re-weighed to allow a calculation of the weight of the milk collected which is compared to the actual litres listed on the run sheet. No allowance is made for any mud or rocks which are washed from the truck, tanker, guards and flaps of the vehicle when calculating the "real" weight of the milk load.

Flo-gineering's Solution
The introduction of a flow-metering, data acquisition and wireless data transfer system provides numerous opportunities to reduce and eliminate most of the manual data entry and data manipulation activities found in the Transport Office.

The Survey Team was able to identify the following potential benefits:

- ✓ Provision of highly accurate, consistent and independent milk volume and temperature measurement
- ✓ No manual driver data recording. Farm is automatically identified and logged by GPS coordinates
- ✓ Milk losses through inaccurate recording can be reduced by 0.2% to 0.6% of all milk collected
- ✓ The milk collection time is reduced
- ✓ Provides a truly representative sampling, minimises potential for sample corruption though human contact and dramatically reduces need for follow-up bacto samples. Sampler self-cleans after each sample is taken. Provides a consistent measurement basis that suppliers can rely on
- ✓ Halves the number of samples required from two to one. This reduces sampling time, cost of sample bottles and barcode labels and an improvement in sample reliability
- ✓ Continuous measurement of temperature of all milk collected with average printed on supplier docket and database register of supplier's average, maximum and minimum temperatures logged and uploaded after each load. Eliminates any "favourable" reporting of temperature by the driver
- ✓ Eliminate need to stir VAT for 2 minutes prior to taking sample
- ✓ Direct data acquisition of pickup details and all associated data related to vehicle movement and collection operations
- ✓ Real-time data is sent from each tanker to a central PC. Data is easily integrated to scheduling applications, merged with lab results or input to SAP and other ERP applications
- ✓ Generation of supplier payments, quality and fleet reports without manual data entry or error
- ✓ A major reduction in data entry and administration costs in the order of magnitude of 80%
- ✓ Provision of numerous management reports on each tanker
- ✓ Farm VAT calibration is eliminated. It no longer matters if the VAT is not level or the dipstick is illegible.
- ✓ A daily supplier report is printed by the onboard printer at each farm pickup. The report lists the supplier name and number, date, start time, finish time, tanker number and driver number, kms from previous pickup, errors/warnings such as milk temp above acceptable limit, volume collected and temperature, previous results from last 10 day's samples, any broadcast message to all suppliers, or a message to any individual supplier
- ✓ A daily factory report details the tanker number, driver name and number, run and load number,

date, start time and finish time, total distance travelled, supplier details including volumes, temperatures and kms travelled, load volume and load temperature, and factory number

- ✓ Quality and fleet management reporting is greatly simplified and enhanced. Mass Management reporting is reduced as the system logs data such as driver details, distances and times between pickups, pumping times, run times, load efficiencies etc
- ✓ Increases tanker yields
- ✓ Reduces driver overtime payments through elimination of weighing and manual reports
- ✓ System monitors tanker load and prevents over-loading or spillage via automatic shutdown
- ✓ CIP report provides a "proof-of-clean" report. Exception reports can be generated for inadequate wash times or temperatures, low flow rates, low wash volumes, high final rinse temperatures, insufficient rinsing and so on

The Flo-gineering milk metering and data acquisition system has been widely acclaimed throughout Australia by most Dairies and Milk Haulage transport companies because the system delivers the results, improvements discussed above and significant cost savings outlined later in this report.

Quantitative Benefits

The Flo-gineering metering system is a state of the art system for measuring minute data about the milk collection process.

Our flow metering system has been approved by the Australian National Measurement Institute and is the only such system to have met their stringent standards.

With the addition of the GPRS modem, data is transferred in real-time from the tanker. This eliminates any downtime at the end of the run from the download of data via cable.

The computer system records sufficient tanker data to satisfy the statutory transport authorities Mass Management audits. It also records all CIP statistics which will assist audit compliance under the Food Safety Act.

The electronic records also suffice as the driver's manifest required under the Road Traffic Act. This data can be manipulated by management to supply KPI's for logistic analysis.

The system includes an automatic milk sampler (this can take separate bacteriological and quality samples, or a combined sample which is now becoming more accepted) which takes a representative sample with minimal possibility of sample corruption due to human intervention.

During the three day Survey, the survey team identified a number of business process activities that would be reduced or eliminated when a metering system is installed. These specific and measurable activities and costs are outlined in the table below.

1.1 PROCESS IMPROVEMENT OPPORTUNITIES

#	Activity	Time	No of Runs	Hourly Rate	Total Cost
1	Driver end of run tabulations	5 min	128,500	$23	246,292
2	Admin daily data entry into MILAP	16 Hrs/day		$20	116,800
3	Admin error correction processing	105 Hrs/mon		$20	25,200
4	Transport Mgr daily run sheet tabulations	10.5 Hrs/day		$30	114,975
5	Field Service personnel review of exception reports	6 Hrs/day		$23	50,370
6	Manual handling of fax results	6 Hrs/day		$23	50,370
7	Weighing of trucks twice per run	10 min	128,500	$23	492,583
8	Temp check and manual sampling time	15 mins per run	128,500	$23	738,875
9	Mass management admin time	21 Hrs/day		$23	176,295
10	Telstra Fax payments	2000/day		$0.30	219,000
11	Two sample bottles per collection		450,000 samples	$0.08	36,000
12	Sample bottle disposal cost		450,000	$0.02	9,000
13	Additional barcode labels		450,000	$0.04	18,000
14	Retesting of Bacto samples due to human error in collection		45,000	$6.00	270,000
	TOTAL			**$2,563,760**	

Not included in this analysis are numerous other tangential cost savings such as:

1. eliminate need for weighbridges

2. eliminate maintenance costs of weighbridges and cost of maintaining weighbridge computers and software.

3. the Flo-gineering onboard computer system can record most of the commonly used fleet management data eg litres carted per tanker, distance travelled by tanker, % of truck yield, % of legal capacity of truck, average load size by tanker, average distance between pickup by tanker, average litres per pickup etc

1.2 IMPROVED ACCURACY COST SAVINGS

In our experience over 15 years in this industry, we have compared the dipstick/weighbridge measurement process to the flow metering measurement process and have consistently found error rates between 0.3% and 0.6% for the dipstick method (using calibrated vessels to determine accuracy).

We were advised that the difference between the dipstick calculated milk quantity collected each month when compared to the quantity that was received at the factory and calculated via the specific gravity weight conversion method showed a monthly overpayment of $182,000.

On further analysis and reasoning, this total figure per month may be the aggregate of overpayments to some farms and underpayments to other farms. It is quite possible that some farmers do not receive equitable payments because of the measurement system and process in place at Sunshine Dairy.

Financial Analysis

The proposed Flo-gineering solution has a useful life of 15 years, hence the financial analysis has equally been developed over this same payback period.

The financial returns are available through:

a. Milk Collection Business

Process Improvements

b. Accuracy Improvements

It can be seen that the savings from both are substantial and material. The investment decision could be based on either components alone, yet the total savings represents a very compelling argument to consider the Flo-gineering milk metering system.

Two financial return indicators commonly used in such capital acquisition considerations, are:

1. Payback period

2. Net Present Value of the savings generated.

PAYBACK PERIOD

The likely payback period is between 1.5 and 1.7 years based on the first year (2007) indicated savings.

NET PRESENT VALUE

Using this accrual based formula for determining today's value of the future stream of savings over fifteen years, the NPV is extremely positive across a range of discount or hurdle rates (from 5% through 12%).

Discount Rate	Process Improvements	Accuracy Improvements	Total Improvements
5%	$31m	$27m	$59m
7.5%	$26m	$22m	$49m
10%	$22m	$19m	$42m
12.5%	$19m	$16m	$36m

Qualitative Benefits

The proposed introduction of milk metering and data acquisition & transfer technologies not only introduces significant quantitative savings but also several important qualitative benefits, such as:

1. Contemporary corporate rules demand that accurate records be kept and presented to any regulatory authority when requested. Certified metering of products purchased from suppliers is both diligent and responsible management discipline. The Flo-gineering onboard computer records all of the data about one of the company's primary activities, purchasing of milk.

2. Recording of the Clean-In-Place event for each tanker at the end of each load is provided. Currently, Sunshine Dairy has some exposure by not being able to provide evidence of the CIP event, the temperature of the washing solutions, the volume of the washing solutions and the duration of the CIP process.

3. Such records are easily archived.

4. Milk swaps can be readily recorded because 95% of competitors to Sunshine Dairy already utilise the Flo-gineering technology onboard their tankers.

5. The auto-shutdown function prevents over-loading and accidental spillage. This saves wasted milk, man hours cleaning up and over loading.

6. Farmers no longer need to have their VAT's calibrated

7. The Global Positioning Satellite system provides real-time information on the exact location of each tanker at all times. The system certifies the exact location of each

pickup and identifies the farm for the driver.

8. A satellite navigation system can be installed in the truck cabin and it utilises the GPS system and modem. This can give real-time scheduling directions.

9. Risk reduction of possibility of litigation from farmers who may feel they have been systematically underpaid for both volume and composition of milk collected.

10. Other users have already implemented an interface of the GPRS data into their SAP application. The immediacy of the data has allowed numerous management information benefits, eg the data is factory independent because it comes to a central PC directly from each tanker.

11. Efficiency improvements in tanker yields will translate into very real long-term quantitative savings to Sunshine Dairy.

Conclusions

There is just no doubt that generous and permanent savings are gained after introducing Flo-gineering's flow metering and data acquisition system.

- the improved accuracy of measurement and integrity of payments to suppliers
- the improved consistency and reliability of the sampling process
- a reduction in the cost of the sampling process
- elimination of the weighbridge function and the loss of downtime of the truck and driver during the two "weighings" each load
- the elimination of manual data entry activities by drivers, managers and administration staff
- a major savings in the cost of sending daily faxes to suppliers
- enhancing the mass management function and reducing the admin time required
- providing appropriate levels of corporate governance as to accuracy of milk payments, records of CIP washes and driver manifests
- the utility derived from real-time data acquisition

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