RE-ENGINEERING SUGAR INDUSTRIES—A VIEW FROM AUSTRALIA

By

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Abstract

There has been significant pressure for the Australian sugar industry to reengineer itself. This paper reviews changes in industry legislation, milling, growing and the grower/miller interface. It concludes that the industry has, in the 15 years since reform commenced with the removal of both an embargo on imports and a fixed domestic price, shown a remarkable degree of reengineering. Legislative controls have been almost completely removed and the industry is now significantly deregulated, while retaining growers’ ability to negotiate collectively and the industry’s ability to sell its sugar through a single desk. Milling has been reengineered through closure and consolidation of mills, new milling capacity and new processes such as dry cane cleaning technology and improved clarification, boiler management and control systems. The growing sector has been reengineered through the development of new farming systems and new approaches to agricultural extension. The grower/miller interface has been recognised as an important area for reengineering and developments include improvements in harvesting practice, harvest scheduling and cooperative development. However, further reengineering—consolidation of farms, uptake of new systems, harvesting and transport integration and rationalisation and restructure of milling—will all be required to ensure a profitable future.

Introduction

The Australian sugar industry has, over the past few years, had a difficult time. Under pressure of low prices, poor crops and a strengthening Australian dollar, the margins of industry participants, both millers and growers, have fallen to zero and below. Prices for cane land have weakened, one mill passed into receivership and was sold, another closed at the end of season 2003, and others are struggling. Floods, droughts, pests and diseases between 2000 and 2003 reduced production. Incomes were affected by low world sugar prices brought on by intense competition in the export market. Although Australia is one of the lowest cost sugar producers in the world, it is also the most highly exposed to the world sugar price, with 98% of its sugar priced against the NY#11 market (BCG, 2003). Although the Australian domestic market takes approximately 20% of the crop, there is neither tariff protection on this market, nor even the ability to extract a transport premium. On top of this, the Australian dollar has appreciated, particularly in the last twelve months, pushing down local returns.

This creates a vital incentive to improve economic competitiveness or see the industry go out of production. The industry must reengineer itself to accomplish this, as it cannot rely on consumers in Australia or overseas to support it. At the same time, it can demonstrate that it has changed considerably in recent years and that further change would build on the reengineering that has already taken place.

This paper will look at the reengineering from four viewpoints: reengineering of State and Federal legislation governing the industry, reengineering in both the milling and the growing sectors, and reengineering at the grower/miller interface.

Reengineering legislative arrangements

Legislative deregulation of the sugar industry was a feature of the 1990s in Australia, as it was in other sugar industries such as South Africa and Brazil (Dias de Moraes, 2000). In 1988, the Australian government abandoned the fixed domestic sugar price, removed the embargo on imports, and replaced both
with a tariff, which in 1988 was set at AUD115 per tonne. This tariff was progressively reduced and was finally eliminated in 1997. This process was in accordance with Australia’s National Competition Policy, which saw the removal of considerable state interference in the economy (and has been attributed with contributing to Australia’s current position as one of the fastest growing economies of the OECD).

Growing and milling controls

Central control on industry expansion was removed in 1991. Prior to this, a ‘Central Board’ determined expansion and new production was resisted and held back by landlocked regions as it meant dilution of the returns from the domestic and preferential markets. Removal of controls and good sugar prices throughout the early 1990s fuelled an expansion in area of 45%, mostly in lower cost production areas with room for growth. Since 1991 (and up to the time of writing in April 2004), decisions on expansion are made at mill area level between a growers’ collective (CANEGROWERS) and millers. Collective agreements are automatically binding on all farmers unless a farmer chooses to ‘opt out’ and make a separate arrangement with the mill. In the case of an unresolved disagreement between the parties, collective agreements are subject to compulsory arbitration. Although the miller has the option to negotiate individually with new entrants, agreements with them may not have ‘adverse effects’ (e.g. season length extension) on the collective. Such individual agreements have not been made; whether this condition has proved the stumbling block is not clear (CIE, 2002; Milford, 2002a). Cane land must be registered as Cane Production Area (CPA) to allow harvesting to take place. The quantum of CPA controls season length and mill supply. This system is administered at the local level but with legislative backing.

These arrangements are about to undergo further reengineering. At the time of writing, a Bill is before the Queensland Parliament, which will essentially deregulate miller and grower relationships, removing virtually all constraints on contracts. For instance, each grower will require a supply contract with his or her mill and, although collective contracts can be written, each grower will have to subscribe. The legislative basis for land controls through the CPA system will disappear, as will recourse to compulsory arbitration. The sugar industry is about to enter into an era that will remove constraints on negotiations between growers and millers and require cooperative action to ensure survival.

Sugar marketing arrangements

Marketing has also been substantially reengineered. In 1988, the Sugar Board, a statutory body, compulsorily acquired all raw sugar and was responsible for marketing all sugar sold overseas, as well as domestic refining under a tolling arrangement with refinery owners. The Board chairman and members were Ministerial appointments. Queensland still operates a single desk for marketing sugar produced in the State, but an industry-owned company, Queensland Sugar Ltd (QSL), now carries this out. The industry in the State of New South Wales (5% of Australian production) withdrew from the single desk in 1988, constructed a refinery, and now sells virtually all of its sugar on the domestic market.

QSL’s marketing program is seen as effective. As a single desk seller, it has the opportunity to direct production to satisfy market requirements and to capture regional premiums (BCG, 2003). However, terms of sale on the domestic market have changed. By Ministerial direction under National Competition Policy, Queensland sugar is sold on the domestic market at export parity price, which is the price that would be obtained if there were fierce competition for this market. This is to ensure that the consumer is not disadvantaged by the legislative grant of monopoly selling power.

The current marketing arrangements will be reviewed jointly by millers and growers prior to 2006.

Changing legislation has therefore reengineered the industry through allowing expansion in lower cost areas and reducing transaction costs, while retaining the grower’s ability to negotiate collectively, and via the industry’s ability to continue to sell Queensland sugar through a single desk.

Reengineering milling

The number and size of mills

The milling sector has undergone considerable change in the last fifteen years. In 1988, there were 33 mills in Australia; since then, six have closed and two new mills have opened. At the same time, mill ownership has consolidated. In all regions there is now a dominant mill owner with either a monopoly on mill ownership or a large proportion of the region’s capacity. CSR Limited owns all mills in the Herbert and Burdekin areas, Mackay Sugar (a grower-owned cooperative) owns the majority of mills in the Central area, Bundaberg Sugar Company is the majority owner in the Far North and Southern regions and New South Wales mills are a single cooperatively owned group. This allows for economies in management, maintenance and operation.
Mill capacity has increased: in 1988, the largest mill crushed 2.1 million tonnes of cane per year. The average is now 1.4 Mt, the largest 3.1 Mt; and there are three mills that crush more than 2 Mt in a 22 to 25 week season with a single milling train.

The two new mills, one in the Ord River district of Western Australia and one in North Queensland, are both highly innovative and automated. The Ord mill features two roll mills, falling film evaporators and novel clarification arrangements. Tableland mill does not include a pan stage; it supplies liquor (> 65Bx) by rail to established mills on the coast 100 km away. It also features two roll mills (Batstone et al., 2001) and significant cogeneration capability.

New products and processes

Within established factories, there have been no wholesale changes in unit operations. However, this disguises huge advances in control and management and attention to operational hazards. As an example, 8 mills now use NIR reflectance spectroscopy for direct analysis of cane for payment and control (Staunton et al., 2004) and all use modern computer-based control and information systems.

Novel processes include dry cane-cleaning technology, greatly improved clarification procedures, the use of continuous pan boiling processes, and improvements in bagasse combustion technologies.

Cane cleaning for the whole of the crop (Schembri et al., 2002) is being actively considered for installation in one of the New South Wales mills. This allows for a whole crop to be harvested and transported to the mill, with greatly improved extraction potential in the clean cane stream, and no cane losses associated with the aggressive cane cleaning on the harvesters. In addition the trash fraction will be available for use in a cogeneration facility.

Within the factory, major improvements in clarification technology have been widely implemented based on the new generation SRI clarifiers, because these clarifiers provide very cost effective improvements in both clarification quality and processing rate. Two very different designs of continuous pan boiling processes have been implemented in many factories because their installation provides cost-effective capacity increases and improved control at the back end of the factory. In addition, the major improvements in bagasse combustion control and stability, which result from the implementation of advanced swirling spreader technology, have now advanced to the stage of conversions on existing large bagasse boilers and installation on new boilers installed to support cogeneration facilities.

Product mix from mills has also changed. New raw sugar brands are being produced, mainly that known as QHP (Queensland High Pol), which competes with the best Brazilian cristal.

Co-products

As the Australian mills confront the need for improved economics, the production of ethanol, the cogeneration of electricity, and other co-product options have to be considered.

The installation of large-scale cogeneration at a sugar mill offers not only the possibility of an additional income stream but also the opportunity to upgrade factory operations so that cogeneration income can be maximised. There have been extensive studies of this option at many mills. However, the economics are not necessarily completely favourable, so uptake has been slow. One mill has installed a high-pressure boiler and cogeneration plant (as well as a 5 ML per annum ethanol distillery); others have announced similar but larger cogeneration projects with the likelihood that three installations will proceed in the next couple of years.

There is a premium in Australia for supply of electricity from renewable sources, improving returns for cogeneration facilities. However, margins are still tight and there is ongoing difficulty in finding fuels that are available in the off-season. Ideology, rather than logic, seems to govern whether a fuel is classed renewable. For instance, sawmill residue has been deemed non-renewable as some of the sawmill inputs came from native forests.

There is ongoing attention to the potential for increased fuel ethanol production. There is currently around 150 ML of ethanol capacity in Australia. Of this, approximately 90 ML is used in fuel; virtually all of this is derived from wheat starch as a by-product of gluten manufacture. For further developments of ethanol production to be viable, at least two of the elements suggested by LMC (2002) should be available:

- an obligation to use fuel ethanol;
- compensation (if necessary) for the higher cost of producing ethanol relative to gasoline;
- means to prevent foreign suppliers gaining market access.
It appears unlikely that the Australian government will mandate for ethanol use in fuel in the near future. Without such commitment, further development of an ethanol industry is stalled.

Reengineering the growing sector

Economic changes in the growing sector have been as significant as those in processing. Economies of scale are available (Hánlon et al., 2000). Since 1988, average farm size has moved from 53 ha to 71 ha, a rise of 35%.

Cane growing in Australia is generally a family operation; this period has, however, seen the emergence of a number of large farms of over 20 000 t; farms in this size range now account for around 35% of production and there are around 10 with production above 100 000 t. Figure 1 shows the distribution of farm size in 2001.

In Australia, farms of less than 50 ha produce 11% of the cane, but this represents 36% of growers. At current margins, farms of this size are unlikely to produce a reasonable income in the foreseeable future. Options are therefore diversification on farm, diversification of income sources by off-farm employment, or merging of farming operations to create larger entities.

The first of these has risks for a-mill area as a result of reduced cane production; if significant areas are lost, it will threaten the viability of the mill. The second poses social problems and would also impede the uptake of new technology. The cost of capital may make the third option a risky one; leasing, which is not a common practice in Australia, may fill this gap.

All cane in Australia has been mechanically harvested since the early 1970s. The greatest change in farming practices in this period has been the almost universal adoption of green cane/trash blanket (GCTB) harvesting systems in all areas except where it has proven unfeasible. The trash blanket reduces erosion, retains moisture, recycles nutrients and suppresses weed growth. The GCTB system requires fewer passes of heavy equipment, leading to a reduction in fuel and labour inputs and a reduced requirement for capital equipment.
Further development of minimum till systems will see more uptake of new systems that are being introduced (Garside et al., 2004). Main elements are:

- controlled traffic;
- permanent beds;
- row spacing to match equipment (1.8 m to 2 m);
- dual row planting;
- zero till planting;
- sprayout of ratoon;
- dual disc, narrow-opening direct planter;
- legume fallow in raised beds;
- GCTB.

This system has significant cost and environmental advantages.

Systems for the extension of agricultural research have also been reengineered in the past 15 years. Until recently, extension was provided by staff from the Bureau of Sugar Experiment Stations (now BSES Ltd) on a one-on-one basis. While BSES has gone from being a statutory body funded by levy to a voluntary, industry-owned company, most extension now occurs through the cell group model; groups of 10 to 20 farmers meet regularly on-farm with extension personnel, and groups set their own agendas for extension requirements. This will improve yields; tracking analysis shows the difference in yields between participants and non-participants in cell groups in the Burdekin region and that differences are apparently becoming larger (Juffs et al., 2004).

New farming systems and a more self-reliant approach to extension are significant areas of reengineering of the growing sector.

**Reengineering the grower/miller interface**

One area of significant reengineering has been the recognition of the importance of the grower/miller interface and a value chain approach to industry activities. The industry's main research funding body, Sugar Research and Development Corporation (SRDC), lists whole-of-systems research as one of its priorities (DAFF, 2003). In recent years, it has been recognised that there are significant economies to be gained from such an approach (Milford, 2002b), and a number of regions have commenced activities to realise these savings.

Firstly, in relation to harvesting, a number of measures have been put in place to implement harvesting best practice. Cane and juice losses occur in harvesters that are not properly set-up or operate with excessive ground speed or extractor revolutions (Sandell and Agnew, 2002). A program to improve operations has been implemented, although there is still a need to extend this further (McDonald et al., 2003). One way in which this will occur is through improved payment systems. Most harvesting in Australia is paid for on a flat rate per tonne. This creates perverse incentives; there is no reward to a farmer who presents a field that is easy to harvest and a harvester operator who produces trashy cane receives more per hectare than one who is more careful. A program to develop improved signals is in place (Willcox et al., 2004).

Programs to improve harvest scheduling are also in place. Harvesting is mainly restricted to daylight hours; better utilisation of harvesting and transport equipment would occur if it were spread over 24 hours. However, this would be offset against some cost in social disruption and, possibly, lower quality cane because of reduced visibility and dew. Some areas are moving in this direction (Higgins and Davies, 2004).

At the same time, it has been recognised that the current practice of maintaining harvest 'equity' throughout the season, whereby each farmer has approximately the same proportion of cane cut at all times, can be improved to maximise district sugar yield (Muchow et al., 2000). Programs to implement this are under discussion.

Perhaps most importantly, growers and millers in a number of regional areas are recognising that adversarial relations that have characterised the industry in the past are not appropriate in a low-income, deregulated environment. Cooperative approaches to cost reduction are becoming more common and structures are in place to foster such cooperation.

Examples are the Regional Industry Boards in mill areas owned by CSR and the Mackay Sugar Industry Partnership, in which millers and growers are working together to reduce costs and improve productivity.
Conclusion

The Australian sugar industry has, during the past 15 years, achieved a remarkable degree of reengineering in the legislative, milling and growing sectors and in system redevelopment. These changes have assisted in mitigating the effects of poor seasons and low prices, but these effects have still been felt and felt severely. Further reengineering; consolidation of farms, uptake of new systems, harvesting and transport integration, and rationalisation and restructure of milling will all be required to ensure a profitable future.

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REFERENCES


HAHIDO una presión significativa de la industria azucarera australiana para hacerse una re-ingeniería. En este documento se hizo una revisión de los cambios en la legislación industrial, la molienda, el cultivo y la relación productor/ingenio. Se concluye que la industria, a 15 años de haber empezado las reformas con la eliminación de los embargos a las importaciones y de los precios fijos internos, ha alcanzado un importante grado de re-ingeniería. Los controles legislativos han sido virtualmente eliminados y la industria tiene en la actualidad muy pocas regulaciones, aunque mantiene la capacidad de los productores a negociar colectivamente y la capacidad de la industria de vender su azúcar a través de una oficina única. Se ha hecho re-ingeniería en la molienda por medio del cierre y consolidación de ingenios, nueva capacidad de molienda y nuevos procesos tales como la tecnología de limpieza de caña en seco y mejoramiento en la clarificación, manejo de calderas y sistemas de control. La re-ingeniería del cultivo se ha llevado a cabo por medio del desarrollo de nuevos sistemas de finca y nuevos enfoques para la extensión agrícola. Se ha reconocido la importancia de la relación productor/ingenio en la re-ingeniería y los resultados incluyen mejoras en prácticas de cosecha, programación de cosechas y desarrollo cooperativo. Sin embargo, una re-ingeniería más profunda que incluya consolidación de fincas, implementación de nuevos sistemas, integración de cosecha y transporte y racionalización y re-estructura de la molienda, serán todos necesarios para asegurar un futuro rentable.