

SOME OBSERVATIONS ON CHEMICAL ECONOMICS

In October 2013 the Grangemouth petrochemical facility in Scotland was threatened by closure over an industrial dispute. This resulted in a high level of commentary both Scotland and the UK in general, exacerbated by the upcoming 2014 referendum on Scottish independence. Concern was expressed that the closure of Grangemouth would have the knock-on effect of closure of Scotland's only refinery which would raise fuel security issues for an independent Scotland. The political pressure resulted in settlement of the industrial dispute (in favour of the company) and for now the operation and jobs appears saved. Since that time Ineos (the owners) have announced plans to make major investments in trans-Atlantic shipment of low cost ethane from the US to Europe which should further improve the profitability of the operation and help its future.

In Australia, the contrast in attitude to the hydrocarbon processing industries is stark. In early 2014 Shell announced the sale of the Geelong refinery and potential closure if it could not be sold. This followed earlier announcements of the closure of the Shell refinery at Clyde in Sydney and Caltex's Kurnell refinery. In March BP announced the closure of their refinery operation at Bulwer Island near Brisbane. These announcements have been greeted with relatively little interest with few commentators expressing a concern that such closures would compromise Australia's fuel security.

An impact of refinery closure will be the closure of chemical processing operations juxtaposed to it. One effect will be on the availability of propylene for the production of polypropylene in Sydney. For now the Geelong refinery seems secure after the announcement of its purchase by Vitol, so that polypropylene production in Victoria may be saved for now. Closure of the Geelong refinery would also undermine the profitability of ExxonMobil's Footscray refinery which would in turn adversely impact on Qenos' ethane cracking operation at Altona.

Because of export LNG projects coming on-stream in Gladstone, there is increasing concern for the future price and supply of natural gas (see statements by PACIA in *Chemistry in Australia*.^[1]). Originally these were to be supplied from coal seam gas (CSG), but political issues with rolling out CSG developments and the high cost of these developments has changed the gas source to include conventional gas sources currently supplying Australian industry. Consequently gas suppliers are reluctant to supply gas that do not meet the high value for LNG exports which results in gas prices being set to double or triple over the next few years.

Because the ethane could be incorporated into export LNG, these changes in the feedstock supply chain will have an effect of the supply and price of ethane for cracking operations in Australia. This ethane price is far higher than ethane feedstock for cracking operations in other parts of the world. Retrofitting back to liquid feedstock would require considerable expenditure in re-building downstream liquids handling facilities.

The rise in price of gas would also have a major impact on the cost of production of other chemicals most notably the production of ammonia and fertilizer on the eastern seaboard. The result would be a major contraction in the chemical and allied industries in Australia which would have significant ramifications for the future employment of chemists and engineers.

The agricultural products industry is often touted as Australia's future. As a trustee of a self managed super-fund, I must say the investment opportunities in this sector have been historically poor and I do not see any prospect of change. We spread the idea that 20% of manufacturing is in the wine industry, but this could be a lifestyle choice for many rather than a future export industry. From my observations the leader in agricultural produce in our region is New Zealand; they dominate overseas wine lists from our region with their Sauvignon Blanc and Pinot Noir and have very low production costs for dairy and downstream industries. Furthermore, Cabernets from Chile and Argentinean Malbec lead the pack in bigger reds. Australia seems happy to play in the second division or supply boutique wines such as Grange to be drunk by politicians and their ilk [2].

In today's global village economy, industries grow by having a competitive advantage. This competitive advantage is often local in character and can be quite specific. Industries without a competitive advantage go into decline unless supported by government regulation or finance. For instance trade to the EU results in import tariffs to "protect" European industry but as recent history shows when some industries have a production cost more than the trade barrier then decline is inevitable. Industry protection can take other forms, for instance, production of ammonia for fertilizer is seen by many countries as a strategic necessity and is highly regulated.

Given the caveat on trade barriers, what are Australia's competitive advantages? The answer clearly (as we all know!) is basic minerals (iron ore, coal, gold etc.) and basic agricultural products (wheat, cotton, wool etc.) which can be exported to the major economies at prices that cannot be matched by local production. For example Australian coal landed in the UK will be of lower cost than UK produced coal.

In the past Australia had a competitive advantage in energy in the form of low cost natural gas and electricity (generated from the abundant supply of low cost coal). However, over the past decade this competitive advantage has disappeared. Domestic gas is being priced relative to the high value north Pacific LNG market and electricity prices have significantly increased from regulation, carbon taxes, renewable energy schemes and infra-structure investment. These changes in the price of energy have major implications for adding value to Australia's minerals, in fact destroying many industries and increasing barriers to new ventures. Most added-value industries are fundamentally chemical process industries so that these changes have major implications for industrial chemistry and chemical engineering in Australia.

In order to understand the position of the chemical industry in Australia, in subsequent papers, I will generate some thoughts on the competitive situation of the Australian chemical industry relative to its peers and in particular against its peers in South East Asia as well as those in Europe and the US.

I will limit the process descriptions to the parts with significant impacts on the underlying process economics. Full detailed descriptions are available in industry handbooks [3]. The economic analysis was developed by ICI and has been published elsewhere [4].

References

[1] "PACIA releases report on global megatrends" *Chemistry in Australia*, July 2013, p. 5; and "Calls for a competitive gas market," *Chemistry in Australia*, September 2013, p.9

[2] See: <http://www.abc.net.au/news/2014-07-15/wine-exports-down/5597506> and <http://www.theaustralian.com.au/video/id-50bDJxbjo5QlgQgTBVsKXv8va7kqJ5Zq/International-drinkers-squeeze-Australian-winegrowers>

[3] W. Buchner, R. Schliebs, G. Winter and K.H. Buchel, "Industrial Inorganic Chemistry" VCH Publishers 1989; H-J. Arpe "Industrial organic Chemistry" (5th. Edition) Wiley-VCH 2010. Process licensor summaries are available in the "Petrochemical Handbook" regularly published by *Hydrocarbon Processing*.

[4] D. Seddon, "Petrochemical Economics - Technology Selection in a Carbon Constrained World", Imperial College Press, 2010 describes the economic methodology based on A. Stratton "Simplified Method for Calculating Product Cost", Technical Note 3, Economic Assessment Service , IEA Coal Research, London 1982.

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