Increasing value-adding

to Australian raw materials

DEVELOPING THE AUSTRALIAN CHEMICAL INDUSTRY WITH GOVERNMENT

Prepared for:

Standing Committee on Industry, Science and Resources

18/08/99

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1 Key recommendations

Adding value to Australian raw materials commonly involves chemicals and chemical related products. A key recommendation of this submission to help a turn-around in the decline of Australia's chemical industry is the participation of government to:

- promote a national perspective, including the development of industry *clusters*;
- facilitate an industry environment conducive to change;
- promote the development and involvement of quality and relevant skills; and
- involve government regulatory agencies and to develop regulations that are ahead of international developments.

Key to the success of this strategy is the establishment of an agency that, in recognition of its public benefit, would be supported by Government.

The central agency would:

- overcome the lack of relevant skills contained in Government departments responsible for industry development. Presently skills tends to be complemented by the better-funded industry and their associations that for commodity chemicals is not always fully and fairly representative of newly developing industry. In other words, to reduce the current bias to factor costs and commodity products.
- provide a focus and coordination of Government departments and agencies that influence the chemical industry. One example, is that the chemical industry is particularly sensitive to non-commercial influences, notably health, safety and the environment. These need not be cost sources as promoted by industry, but instrumental in promoting innovative and competitive products by ensuring the regulations and standards are at least in line, if not ahead of world trends.

We are firmly of the opinion with international precedents, that there is a need for a new paradigm for industry development - not one aimed at costs, government assistance and other publicly funded forms of direct and indirect assistance, but of creating a smarter innovative industry. Key to the success is a close link with government as a facilitator, effective domestic competition and a network of quality skills.

2 Why the chemical industry is relevant to this Inquiry

Chemicals are the next value-added step to Australian raw materials so its industry should be an important part of the review by the Committee. The chemical industry should be a strong and fast growing sector of Australia's manufacturing base with Australia's extensive natural resources as raw materials and the fast growing markets in Asia. However, the key commodity sector, that is closest to raw materials, remains in a state of decline with little growth and now failing trade performance. Presently chemicals contribute some $7 billion to the annual current account deficit (3). Despite its track record, it has in our opinion outstanding potential to become the fastest growing sector of Australia manufacturing industry.[1]

This submission identifies some important roles for Government that will take the industry away from the legacies of Australia's protectionist era that still singularly overemphasises factor costs, regulations and other basic perceived impediments. As signalled in this brief submission, there are more valuable long-term influences and opportunities for advancing this high value added industry than addressing costs.

Some present impediments

At the State level, relevant Government agencies are focussed on the manufacture of commodity chemicals that commonly use imported technology to produce price sensitive products implicitly vulnerable to exchange rates and factor costs.

More significantly, there are no signs for the development of industry *clusters* in Australia that are so important for internationally competitive industry[2]. Significantly, while there are companies that could seed the development of a "new chemical industry", they are not effectively represented by industry associations. Equally important, there are many operations that are world-leaders in value adding that are not identified as chemical companies though undertaking chemical operations[3]. This includes the alumina producers manufacturing aluminium oxide, particularly notable as the largest producer and one of the biggest in the world, Alcoa, has its world research centre located in Perth Western Australia. No such equivalence of a research base is evident in the commodity chemical industry and only limited, but potentially

[1] Australia supplies about 40 per cent of the world's ilmenite and about 25 per cent of its rutile. In contrast to its dominance in titanium minerals, Australia supplies only about a 3 per cent share of the world's titanium dioxide pigment production of around 4 million tonnes. This imbalance implies significant opportunity for adding further value - it could grow to the size of the $2 billion alumina industry.

[2] Clusters are the *collective assets* of groups of firms that serve to reduce transaction costs, boosts efficiency, and improves incentives. These collective assets includes information, specialised institutions and even just reputation, that provide benefits to help firms choose the best location for growth and productivity that override the need to locate near raw material sources or markets. Acknowledging some grouping, such as at Yarwun in Queensland, Altona in Victoria and Kwinana and Kemerton in Western Australia, these are not well developed clusters.

[3] This is particularly notable as the titanium dioxide pigment industry is considered a chemical operation (ie. in contrast with the $2 billion aluminium oxide industry. Interestingly, were Australia to convert all its titanium minerals, including that exported for overseas processing, the pigment industry would equal Australia's large and competitive alumina industry. This industry is currently represented by PACIA.

larger in the specialty chemical sector so the $2 billion dollar alumina industry could signal the potential for the chemical industry. Another industry is the rapidly growing laterite nickel industry using chemicals to produce nickel in a chemical process. Significantly, the Anaconda operation (Murrin Murrin, W.A.) has signalled its interest in producing phosphate fertiliser (from nearby Mt Weld) and magnesium metal. There are important pointers for value adding strategies. These rapid growth companies have no links directly with the voices of the chemical industry that is still signalling its potential demise. A valuable opportunity exists for cross-fertilisation that could be provided by a Commonwealth agency as proposed in this submission[4].

From our perspective, there is a general failure to exploit opportunities to the fullest with Government often receiving imperfect advice. A key contributor is that old foreign-owned industry and importers dominate the key association while some new companies are not even represented.

This proposal presents a new paradigm for creating a more productive environment for adding value to Australia's raw material that will make it less sensitive to the commonly promoted issues of factor costs, exchange rates, infrastructure and Government assistance in its various forms. There are important roles for Government with international precedents pointing to success. One such role is for it to become a *facilitator of change* promote healthy long-term development and, in particular, to identify and build on sources of *relevant* and *quality* expertise to shape a smart industry. As pointed out under Regulations (4.1), Australia's regulatory agencies, could also contribute to its development. Rather than being seen as cost sources for industry, they could in fact contribute to the competitive development of industry. For the moment industry sees it as a operating cost source and the agencies on public welfare. An outstanding opportunity exists for a new role without compromising their primary objective.

The high profile and respected US based Michael Porter undertook a major survey of world industries and identified role models for government in Australia[5]. While disparaging of attempts by Government to directly promote industry, important roles were nevertheless identified. A key role was to promote the *quality* of education and training that Porter showed to underpin successful industries overseas some of whom lacked our natural resources. In countries such as Switzerland, Germany, Taiwan, the USA, education centres closely cooperate with industry to develop a robust industry that is less sensitive to exchange rates and economic cycles[6]. A key role for Government should therefore be to help shape a skill base to promote excellence in chemical technologies with some remarkable precedents for success.

[4] A.C.T.E.D. operates CIP in Western Australia aimed at promoting such linkages. CIP has been address by Deputy Premiers, CEO's of leading resource and chemical companies and international consultancies. It is presently confined to this smaller state.

[5] Porter, M.E. The Competitive Advantage of Countries, Macmillan Press Limited 1998

[6] During the Asian economic downturn, Taiwan's sophisticated chemical industry continued to operate and trade unlike the lower technology-intensive industries in SE Asia. Australia's chemical industry is particularly sensitive to economic downturns.

All this represents a new paradigm away from commodity chemicals underpinned by factor costs.

The initiative of the Standing Committee to inquire into this industry is applauded. It is hoped that if it identifies appropriate strategies, including that of a national agency, it will ensure not only that the industry will develop in a long-term sustainable manner, but also avoid the consequences of expedient Government initiatives that have hallmarked the industry to date. Notable are not only those of the aforementioned agencies, but also that of the Fraser Government in 1979 that served to disadvantage the Altona-based petrochemical industry that could have become internationally competitive based on Bass Strait gas. Another is the offer to Comalco to establish in Gladstone Queensland (4.2).

There are many expressions of failed opportunities that in this decade alone that range to the SOCOG's opportunity with PVC plastic for the Olympic Games village (4.4). The prospect for developing a new market. There are extensive networks available to Government that has not been effectively tapped into.

The Committee could have a significant influence on the development this industry to become major value adder to Australia's raw material base. It will require a different approach and different contacts hitherto made.

A permanent Government agency to promote the chemical industry in Australia is therefore highly recommended. Based on our experience, including with our Internet pages (www.acted.net) and our CIP conferences, such an agency is past due and in a sense and to a limited degree, A.C.T.E.D. has been acting as such without recovery of costs. There are discussions with Government under way in W.A. to seed such an agency in Western Australia.

This submission is aimed to promote a positive drive to advance a potentially significant and fast growing sector of Australia's manufacturing industry.

3 Overview of Australia's chemical industry

Australia's chemical industry, represents about one-tenth of Australia's manufacturing sector employing 45 000 with an annual turnover of $18 billion, which represents 1.3 per cent of GDP. It is a diverse industry ranging from large-scale petrochemical complexes, that manufacture polymer chemicals by a process of *synthesis*[7], to small business that manufacture by simply mixing chemicals to produce pesticides, paints and nearly all pharmaceuticals. Raw materials too are variable, ranging from locally available hydrocarbons and minerals, to sophisticated chemicals. The common link is that they use and produce *chemicals*[8].

Since the mid-1970's employment has fallen by one-third, research spending is down, foreign ownership is growing and imports are increasing so that the trade imbalance has reached $7 billion per year (*figure 1*). Since the latter part of this decade as shown in *figure 2*, the recovery in trade performance has stalled with a decline in 1998. During this period too, the chemical industry's contribution to GDP has fallen to one-half that of 1975 to just 1.3 per cent of GDP (*figure 3*) so that by any measure, the industry has been in decline. The industry nevertheless has outstanding potential given Australia's resource base and fast growing markets to its north.

It is an industry that has changed in size and composition. Since the mid-1970s, employment, the number of manufacturers, the industry's contribution to GDP and the number of synthesised chemicals have reduced by around one-third. While undergoing this contraction, the demand for chemicals in the home market has continued to grow by around 3 to 4 per cent per year with even faster growth in the nearby Asia/Pacific region. In this apparent contradiction of contraction in the face of growing demand, Australia has adequate petroleum, coal and mineral resource endowments, some of which are exported to become raw material inputs for overseas chemical industries.

In the last few decades, Australia's share of investment in the Asia/Pacific region has continued to decline suggesting the local availability of natural resources and low sovereign risk is not sufficient to attract adequate investment.

It is relevant to note that since the mid-1970s import tariffs that ranged to 60 per cent have been phased down to a maximum of 5 per cent in 1992. Industry predicted a *collapse*[9] in the face of Government intentions to further reduce import tariffs, implying that its continued contraction was promoted by a reversal of the government's protectionist policies. The contraction however is not uniform, and some sectors, such as manufacturers of industrial gases, explosives and pharmaceuticals are growing strongly. There are also new investments in export-

[7] *Synthesis* is defined as representing a change in the molecular structure to contrast with a change in the mix of chemical substances that are used to produce paints and many adhesives. Broadly, the synthesis of chemicals is more capital intensive than those that manufacture by the mixing of chemicals, sometimes referred to as *formulators*. The synthesis sector provides a large part of the raw materials to the formulating sector.

[8] The *chemical industry* is defined by the Australian Bureau of Statistics as industries in Anzic 275 and 276.

[9] *Chemical Industry in State of Collapse*. The Australian June 1992.

oriented manufacturing such as WMC's ammonium phosphate fertiliser project in Queensland. These changes in industry are reflected in the changing profile of Australia's trade in chemicals and the move away from production in the original centres at Botany and Rhodes in New South Wales, to centres in Queensland and Western Australia. It is notable, that all major investments are in commodity chemicals and with the exception of the WMC's investment, all are small scale. Equally seriously, there is as yet little evidence of industry clusters.

Despite prospects for growth, the industry continues to signal insecurity about its future[10]. A $2 billion petrochemical project in the north-west of Western Australia, the fifth chloralkali venture under review in Australia, has not progressed beyond a preliminary feasibility study and has already been deferred. In our opinion, is most unlikely to proceed as proposed[11].

3.1 Potential for growth

There is significant potential for growth in the industry. Australia today has a foreign trade deficit in chemicals of $7 billion per year as it imports three-times more by value than it exports. Its industry is just 1.3 per cent of GDP while for Asian countries it can be as high as 9 per cent as in India, and 6 per cent in the more open economy of Taiwan. This suggests potential for growth for the Australian chemical industry if it can establish a competitive advantage in the market.

As an example, Australia is the world's largest importer of caustic soda derived from salt, petroleum gas and energy that are significant exports from Australia. Other raw materials are sometimes only partially processed in Australia to the end-product chemical, such as ilmenite and rutile, while other chemicals in which it should have a comparative advantage based on traditional factor cost considerations, such as energy-intensive urea, are often largely imported.

Australia is also increasingly internationally competitive in resource development technologies that often involve chemicals either sophisticated in their design or applied in sophisticated processes. This includes the acrylic polymers used by two Western Australian companies with evidence that the technology developed in Australia is now being applied in overseas manufacturing plants. Another foreign company has developed expertise in using high-mineral water in metal production and is using those skills in overseas regions. The flow-on effect and interaction with the resource sector could be a stimulus for the further development of chemical products and services for international markets. Again, international precedents have shown that at the interface of competitive sectors, innovative and competitive products are often produced. For the present and for a large part, the chemical

[10] '*In danger of extinction.*' Australian Financial Review, August 28th 1998, p 51. It quoted CEOs of the largest chemical company and chemical industry association in Australia. At the Second Australian Chemicals Summit 26, 27 July, 1999 in Melbourne, the commodity chemical industry association PACIA introduced itself with a funeral march. One could conclude that government agencies do not rank highly as on assuming influence over the conference all but one government speaker was removed by PACIA from the agenda.

[11] The conclusion is complex and outlined in the A.C.T.E.D. web pages at www.acted.net.

industry "borrows" the competitive advantage of the resource and agricultural sectors or draws on freight and local advantage with few export-oriented activities.

To Australia's north are very successful new chemical industries operating without relevant natural resources. The changing profile of Australia's chemical industry to more competitive activities, growing international markets, and its often abundant indigenous raw materials, suggests Australia's chemical industry may continue to evolve and grow with a substantial contribution to Australia's GDP and trade balance. With international precedents, other stimuli to growth could include the development of chemical products, and related services, promoted as a result of their use in Australia's internationally competitive resource development sector.

There is of course prospect for market failure that inhibits industry development, potential for stimulated externalities that result from investments, and prospects for the international promotion of Australia's products and skills that could further stimulate domestic chemical manufacture.

The question the Government should primarily aim to address is what is required to achieve international competitiveness in the chemical industry? In this context it is useful to note that, in contrast with most developed and developing countries, the Federal Government has no specific policy for the chemical industry while some State governments practise facilitation forms of assistance in response to investment proposals. As has been the experience overseas, certain sectoral policies, specifically for the chemical industry, may in the end be shown to be unnecessary being without public benefit. However there are Government initiatives that could be emphasised or reshaped to productively stimulate activities in the chemical industry to enhance its competitiveness and development. Such development could result in significant net public benefit. Included are; the policies of the Australian Competition and Consumer Commission (ACCC) as it might influence the necessary scale economies required for international competitiveness; measures for promoting the pooling of R&D facilities for sharing by industry; the means to more fully benefit from the interaction of the chemical industry with Australia's resource industry; and other assistance to promote industry rationalisation and investment. The ACCC does not acknowledge net public benefit in its considerations.

A useful outcome for this Committee could be alternative scenarios and policies for Australia's chemical industry by say year 2020. If funding could be made available by industry, the economic value of the proposal could be estimated by a Computable General Equilibrium analysis, such as that provided by the Monash University model.

The ultimate aim should be to identify the opportunities and impediments for Australia's chemical industry tapping into the nucleus of the smaller and unrepresented companies that are spearheading the new industry.

4 Examples and issues

4.1 Regulations

Regulations and performance standards are generally perceived by industry as presenting cost imposts and inhibiting their ability to compete. Included are regulations on product performance, safety, the environment, energy efficiency, operating conditions and product liability laws with standards on performance.[12] Porter observed that if these are more advanced than in competing developed countries, these can in fact, by enhancing the sophistication of the home market, provide an incentive to innovate and contribute to international competitiveness.[13] In other word, appropriate regulations instead of retarding industry, can provide important incentives. Conversely, regulations that are anachronistic or less advanced, serve to reduce the incentive to innovate and hence reduce the competitiveness of industry.

Therefore if the Government regulatory agencies are too sensitive to claims about cost imposts on industry, they serve only to undermine national competitive advantage and create opportunities for foreign suppliers with more advanced products.

An important role for the regulatory Government agencies is therefore to promote and enforce regulations and standards that enhance buyer sophistication to at least international standards. With potential by that to stimulate or retard industry, an important role for Government is to monitor trends in the development of foreign regulations and standards. A system of international review should be initiated to monitor their development and thereby ensure domestic regulations and standards not only match but are also advanced by anticipating trends. Clearly too there is an important role to promote their early adoption with rigorous enforcement by government.

Thus while many of the regulatory agencies define their roles in social or public welfare terms, they miss their potential valuable role of stimulating national competitiveness. These agencies can be very instrumental in promoting a sophisticated home market and hence a competitive industry.[14]

4.2 Commonwealth Government offer to Comalco

As reported in the media, Government, through Invest Australia has offered a $100m incentive to Comalco to establish an alumina refinery in Gladstone Qld. The refinery has been identified as important to underpin a gasline venture to bring energy from

[12] Too extreme however, product liability laws and other regulations can in fact serve to retard innovation and competitiveness.

[13] An obvious conclusion is that reducing the incentive for firms to comply with such regulations only serves to reduce innovation and incentive to upgrade and is therefore counterproductive to international competitiveness.

[14] This is not a principle that applies to distribution channels as regulations only serve to increase costs undermining the competitive advantages of other industries.

PNG across the Torres Strait to Qld as it will require 80 petajoules pa of gas when expanded to stage 3.

In W.A. the PPP is held back by scale limited by available ethane feedstock that can only be economically extracted from domestic gas. Clearly any expansion of local demand, including by alumina producers Alcoa and Worsley, are important contributors to it viability. Only some 500 000 tpa of ethane could be extracted at present from domestic gas.

In a global market, promoting a new alumina producer in Qld, clearly works against expansion of its expansion in W.A. and hence the supply of ethane for the ethane-dependent PPP. In other words, while the offer by Invest Australia may bring foreign energy to Qld and another alumina producer, it is also undermining the potential supply of valuable ethane to the PPP and hence reducing the economic viability of a feedstock-dependent project. Quantified, the refinery in Qld will, in displacing expansions in W.A. 's alumina refineries, reduce the supply of ethane by some 150 000 tonnes pa - a very valuable 25 per cent of ethane available now.

More than that, the PPP, unlike the Comalco refinery, can seed a range of high value-adding projects including those that produce chlorine as a by-product.

Therefore while one part of the balance sheet that Invest Australia can use to demonstrate the benefit to Qld of its $100m incentive, on the debit are the reduced viability of alumina expansions in W.A. that would benefit from scale economies, the PPP and related chemical projects. The evidence points to a net public cost from Invest Australia's involvement in the market place.

Some value-adding analysis points to a net cost of is before considering the impact on alternative gas from the Timor Sea.

Invest Australia initiative has some resemblance of an action by the Fraser Government in 1979 that divided Australia's petrochemical industry undermining the potential of Bass Strait. It required ICI to invest in a $300 million gas line from SA and in the process killing any opportunity for the state to capture the benefits of it ethane reserves. The petrochemical complex in Victoria failed to achieve international competitiveness in the process.

4.3 Australian Competition and Consumer Commission

The Australian Competition and Consumer Commission (ACCC) has allowed many mergers in the chemical industry having only regard to the extent of import competition[15]. Some of these mergers include that of the styrene operations of Dow Chemical and Huntsman Chemical and the polyethylene operations of Orica and Kemcor. While acknowledging Michael Porter's[16] observations in its annual reports, about the importance of domestic competition, it has allowed the creation of domestic

[15] Private discussion with ACCC personnel confirmed that import competition is the dominant consideration and public benefit is not taken into account.

[16] Competitive Advantage of Nations, op cit.

monopolies. Most notable as these often do not promote production economies and the innovative development of new products.

The ACCC should recognise the importance of vigorous domestic competition to promoting innovation that will see the development of new products or processes. Australia remains locked into using imported, and at best second generation technology.

4.4 PVC-free Olympic Village for the 2000 Games in Sydney

In 1996 the SOCOG Committee was pressured to introduce a PVC plastic free Olympic Games village. The CSIRO was funded by PACIA to identify the risks of PVC and alternatives. Being favourable to the use of this plastic, an opportunity for an alternative plastic was never evaluated independently.

The significance of this singular event cannot be overstated[17]. Given strong incentive to reduce PVC (and other chlorine chemicals), Australia should have evaluated alternatives to PVC resin. Australia, is not only a major producer of titanium minerals and pigment it has developed patented technology to produce superfine forms of the titanium dioxide pigment which is used as an UV opacifier. Australia could not only have extended its market for a new plastic to replace PVC in some applications, it could have extended its market for this very valuable product.

The PVC manufacturing industry in Australia is represented by Australian Vinyls and employs only around 100 persons in manufacturing that in fact also adds little (if any net of tariffs) real value in the process. Australian Vinyls has been offered for sale in the international market and is facing an uncertain future. The prospect of alternatives to PVC should have been evaluated by an Australian agency given the important opportunity that was lost[18].

4.5 Italian Ceramics Industry - a model for overcoming impediments

In the 1960s, the Italian ceramics industry imported not only its clay raw materials and its production equipment, it even used high-cost imported gas for its kilns. Fundamentally uncompetitive, it stimulated innovation and experimentation that was reinforced by local rivalry that led to new products and technology that avoided those crucial impediments. Even their technology is exported to countries that use it to compete with Italy's ceramics industry. Today, it represents one-third of world production of ceramics; exporting nearly one-half of its production to represent one-

[17] For example, the MD of a Chinese petrochemical company approached the author in Shanghai indicating that if Australia had banned PVC resin at Olympic Games, it would have been a flag to the world. There is significant pressure to reduce PVC use even to the point of trade bans. A.C.T.E.D. was retained by the Department of Foreign Affairs and Trade to evaluate inter alia the precursors to PVC resin.

[18] The author acknowledges the importance of chlorine in the Pilbara Petrochemical Project for the Burrup Peninsula of Western Australia. Chlorine is there are by-product that while presently being targeted for use in PVC, could be applied for alternatives, such as chlorine dioxide used in the paper and pulp industry. In any event, some so called niche markets, in this case an alternative to PVC, can be much larger than the combined output of the Australian plastics raw material industry.

half of world trade. It started with no raw materials, no local technology and high energy costs.

5 Key observations and recommendations

The following summarise areas where the Government could substantially influence the development of a sustainable internationally competitive chemical industry.

Observation	Detail	Recommendation
Stage 1 industry - locked into limited commodity production.	Nearly all value adding is in commodities sold on price using imported technologies. A large part of industry is vulnerable to closure for being underscaled and uncompetitive[19]. Many other chemical activities derive advantage from tapping into the competitive advantage of resource development and agricultural industries. There is no indication of advancement to stage 2 industries where technology is modified and developed within Australia and thereby becoming less vulnerable to factor costs and/or exchange rate movements.	Industry to be encouraged to form clusters with greater emphasis for integration with skills sources, notably universities. Government can play a key role in facilitating a culture accepting of change. An federal agency is recommended.
Isolated operations - no clusters or substantial	A key success to overseas chemical companies is the clustering or grouping	Government should identify and remedy the fragmentation of

[19] The industry is competitive as its plants are generally fully depreciated so there is no requirement for recovery of capital cost.

vertical integration.	that offers substantial competitive advantages. While some centres (eg. Altona in Victoria) share some facilities, they are in reality limited. For example, BHP's proposed ammonia/urea project will be located at Lara Victoria and not at nearby Altona[20]. The nature of the industry suggests it should have two or three key clusters.	industry.
No effective policy for project integration and a national strategy	Projects are often promoted on a case by case example. One example is that the Commonwealth Government is offering $100 million to an alumina producer for Gladstone without regard to the undermining effects to W.A.'s ethane availability (4.2). Projects are assessed without consideration of the cluster benefits that may result. For example the Pilbara Petrochemical Project is being assessed as a stand-alone project another is the BHP ammonia/urea project for Lara Victoria. A national 'package strategy'	A national agency located in Canberra at which state Government agencies with responsibility for the development of the chemical industry are represented.

[20] Obviously there is only limited synergy potential for an ammonia project with activities at Altona, the issue is nevertheless relevant for Australia with the absence of effective industry clusters. Australia's titanium dioxide pigment industry for example pays twice the world price for chlorine because of the absence of an independent chloralkali operation.

	would assist.	
Failure to capture benefits or exploit indigenous technologies.	In the rare instance where technology is indigenous, the country fails to obtain commercial benefit. For example, two companies in Western Australia have developed world class skills in acrylic polymer chemicals by working with Alcoa (who has located its world research centre in W.A.). The companies apply the skills in their overseas operations without return to Australia. Some countries have developed policies to ensure royalty returns.	Requires further evaluation by Government by case studies.
Regulatory bodies focussed exclusively on public welfare so that industry perceives them as compliance costs.	An untapped opportunity exists for shaping advanced products and processes. Advanced regulations can stimulate advanced competitive products with international precedents for success. See also proposed ban on PVC plastic products for the Olympic Games Villages (4.4). It is worth noting that BHP supplied its reinforced bar technology to its Australian competitor Smorgon Steel and promoted it too become an Australian standard. It is difficult for imports to comply and being advanced,	A federal Government agency should be established to review international trends and ensure Australia's regulations are at the forefront and promote their adoption as appropriate in Australia

	promotes opportunity for exports.	
Industry association bias to favour old industry to emphasis costs.	The industry association representing commodity chemical manufacture in Australia is the Plastics and Chemical Industries Association (PACIA). Chemical synthesis is less significant than importing and plastics forming. Its bias is well represented in its publication "Survey '98". WMC, who is investing in the largest chemical project this decade is not a member, nor is Vanadium Australia and BHP. Among its members it has only one significant Australian manufacturer out of 24 companies that are significant manufacturers.	A federal agency would assist. Alternatively or as complement, funding groups to provide extended networks.
Skills potential not adequately represented to Government.	The links between industry and skills are not well developed being titular. Organisations such as the Institution of Engineers Australia, Institution of Chemical Engineers in Australia, The Royal Australian Chemical Institute could make contributions to promoting skills.	A national agency as above.

Figure 1 Imports and exports for chemicals by SITC group. Imports exceed exports by factor of three on average. **[Not Reproduced]**

Figure 2 Trade performance for nearly all sectors has reached a plateau in mid 1990s and showing a decline in 1998. **[Not Reproduced]**

Figure 3. Though turnover continues to increase, the value added as % of GDP has fallen to a half since the mid 1970s. During this period of decline, employment has fallen from 75 000 to 45 000. **[Not Reproduced]**

5.1 A.C.T.E.D. Pty Ltd

Since 1988 A.C.T.E.D. has provided consulting services to industry and government. This includes for the Department of Foreign Affairs and Trade on the impact of trade bans on Australia involving $3 billion in trade and manufacture and a petrochemical complex valued at $30 million. The company provides services for the Australian Chemical Specialties Manufacturers Association.

The company provides an Internet website “Chemicals in Australia” at www.acted.net which has been described as the broadest for any country’s chemical industry.

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Mr Van Santen is a Fellow of the Royal Australian Chemical Institute and is Australian Chair of its Industrial Chemistry Division and represents the Division at the Federation with the Institution of Engineers of Australia and the Institution of Chemical Engineers in Australia. In the past 18 months, six international conferences have been addressed on the subject of chemical industry development.