

# Why the borate industry must respond to the market in order to avoid substitution

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**ABSTRACT:** Artificially holding the price of borates substantially higher than the equilibrium price is severely damaging to the industry. Suppliers with economic reserves measured in years rather than decades are more likely to take short-term profits than show any interest in preserving a healthy market. In a highly concentrated oligopoly this can at best lead to collusive pricing and capacity fixing and at worst drive valuable customers in a very finite market towards substitutes. More significantly, there are compelling reasons for companies with limited reserves to inflate the market. Even the smallest reduction in the long-term price of borates can substantially reduce the commercial viability of the ore body. This skews objectivity as it can wipe billions of Dollars off the value of a mining company and is far more critical than the year on year profitability.

## 1 INTRODUCTION

A current topic of debate in international financial markets and the business world is corporate governance, or the "Profits Bubble". Are companies actually worth what the directors and the auditors tell us? Up until now most shareholders have tended to believe in the voracity of the annual report and accounts. The recent failure of Enron and Worldcom indicates that sometimes directors of companies are not always wholly truthful and the auditors themselves may not be reliable. They do not always do what they are supposed to do, act in the interest of the shareholders. This appears to be especially true if the auditors (or firms "closely associated with the auditors") enjoy significant consultancy revenues from the same client.

So far the spectacular failures have been confined to the USA but in the present global economy it is highly likely that other companies are pursuing similar business strategies across the world, including London.

What relevance has this to the borate market? The 1<sup>st</sup> Boron Symposium is partly a suppliers' forum and presumably most of the suppliers are interested in the long-term health of the borate industry. But what if one of the major suppliers is out of step with

the others and is not committed to the long-term future of borates? This paper seeks to investigate the likelihood of such an aberration and the possible adverse impact on the market.

## 2 OVERVALUING ASSETS

Basically a company may be valued in two ways, either in terms of its equity - all its assets, including tangible things like cash, current assets, working capital - or how the market values it. Traditionally, conservative investors used to favour companies with a substantial amount of equity to back up their value but recently, the intangibles generated by marketing have created enormous leverage based on what is sometimes a relatively small core business. Lately investors have pushed the boundaries of equity by valuing qualities that have no tangible or concrete value. Some of the "Dotcom" companies epitomized this type of valuation. Robert Wilson of Rio Tinto describes this as "near-term" impact on shares (Wilson, 2000).

The mining industry has always been fairly conservative with the value of mining companies closely linked to the size of their reserves and the price at which the end product can be sold. There are

a few refinements, such as the amount that can be mined economically, and the long-term forecast price over the life of the mine but up until now, this has been the key formula (Lane, 1988).

In the present day where environmental and safety issues are more prominent, and extractive processes less fashionable, mining companies have had to become adept at marketing their industry (often to offset adverse publicity). The question is whether, having developed the skills of marketing as a defence mechanism, the mining companies have actually followed the lead of the Dotcoms and used the leverage of marketing on top of the undeniable substance of their core business to massively inflate the value of the company?

In a world where we appear not to be able to rely on the audited accounts we have to look for other indicators in order to form an opinion regarding the value of a company. This paper examines some of the indicators in the borate market.

### 3 WHAT DETERMINES PRICE

Everyone knows that the basic factors that govern the price of a commodity are supply and demand (Fig. 1). If supply decreases or demand increases the price will go up and if the supply increases or the demand decreases the price will go down. Equally if the price is high new suppliers will contest the market and, if the price falls, higher cost producers will exit the market. If demand increases and the supply is inelastic, meaning that there are significant

**Equilibrium price and quantity**

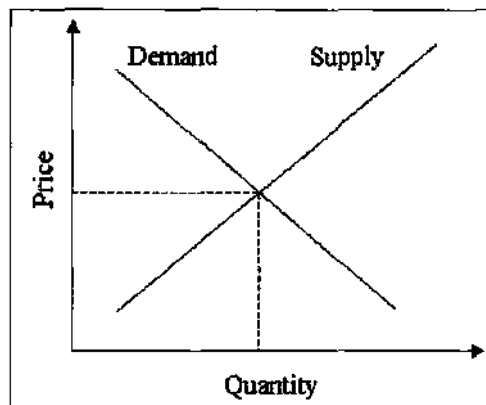


Figure 1. Demand-Supply equilibrium.

barriers to entry for new suppliers (e.g. they do not own a borate mine), the price will rise more steeply.

Borate suppliers pride themselves that the world market for borates is not a "Terminal Market". Although not a strictly accurate application of the term, what they mean is that borates are (as yet) not traded as commodities. There is not a trading centre for borates in say London or New York and prices are negotiated individually between sellers and buyers. The advantage to the seller and the disadvantage to the buyer in such a system is that the mechanisms that achieve the equilibrium price, are less effective. The sellers, especially in such a duopoly (highly concentrated oligopoly) as the borate market, can manipulate the market to their advantage and thereby maintain higher prices than the pure supply and demand dynamics would normally sustain.

The mechanisms for achieving higher than equilibrium prices, whether legitimate (market segmentation, product differentiation and yield management) or illegitimate (collusive pricing and capacity fixing) are unimportant in this argument. What is being considered here is whether in the long term the supplier market benefits or loses-out by such strategies.

### 4 THE BORATE MARKET

The borate market is pretty well known to both customers and suppliers but for the sake of completeness, and for any outsider reading this paper, it is summarised here.

The borate market is best described as a highly concentrated oligopoly. Seventy five percent of the market is controlled by the two major producers, Etimine, based in Turkey, and Rio Tinto Borax with its main mine at Boron in California. The rest of the market is made up of half a dozen or so minor producers. The market is, to all intents and purposes, a duopoly. Due to economies of scale and other factors the two main suppliers have low cost bases and the other suppliers higher costs, some significantly so. The lower cost producers can compete on a worldwide basis because they can absorb the transportation costs whilst the higher cost producers are restricted to a geographical area (cone of supply), again to a greater or lesser degree determined by their underlying costs. In all markets the two major producers are the price setters and can determine the price according to the market penetration to which they aspire.

There is one very significant difference between the two major producers. Rio Tinto Borax is well

into the latter part of the Boron mine lifecycle whereas Etimine's mines are in the early stages of theirs (Fig. 2). According to the Turkish Ministry of Energy and Natural Resources, Turkey has over two thirds of the world boron reserves totaling over 870 million tons (Turkish Embassy, 2001) Conversely, the US Geological Survey reports the USA reserves at only 80 million tons (Lyday, 2000) The ore seam at Boron plunges at an angle so that the stripping ratio increases significantly as more ore is extracted (Durucan, 1999).

Mine(s) lifecycle

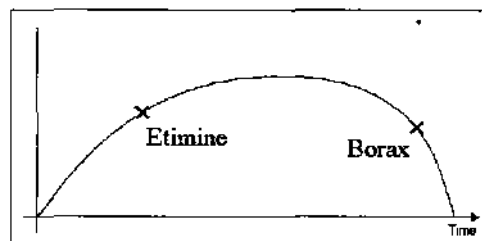


Figure 2. Etimine and Borax mine lifecycle

It follows then that the commercial It would be logical for the business in the latter stages of the lifecycle to have an interest in achieving the highest possible price for its remaining reserves and retaining maximum market share before the price collapses. The strategy for a longer-term player should, if it is to protect its investments, be to secure the long-term prospects of the borate market. This means that pricing policies should be adopted that gives reasonable profitability but do not drive customers away from borates and towards substitutes. Hence, it may be in the interest of the short-term business to collude on prices and capacity but others would be (rightly) cautious because, aside from potentially breaching the competition laws, their interest would be to have a long-term market into which to sell their borate reserves.

## 5 MINING AND PRODUCTION

Mining operations in Turkey are either underground or easily exposed open cast. US Borax's open pit mine at Boron is already 750 metres deep (Borax, 1996). For an ore body measuring 100 metres across by 20 metres deep (assuming an average pit slope angle of 40°) this would give a stripping ratio of 1:363 (Fig. 3).

## Stripping ratio - open pit mine

(Modified after Bohnet, 1990)

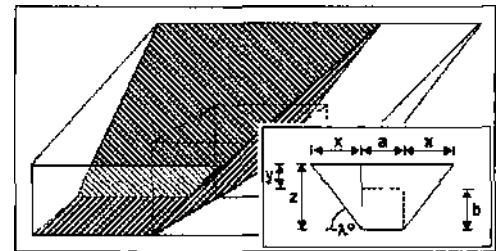


Figure 3. Stripping ratio.

Effectively this means that for every ton of ore mined 363 tons of overburden has to be removed and hauled to the surface.

The haul road from the bottom of a 750 metre deep mine to the top, given a 5% gradient, is almost ten miles long.

There is a great temptation in an open cast mine to reduce the stripping ratio by increasing the average pit slope angle. For example, increasing the angle from 40° to 45° mere is a saving of 16% that in financial terms is a huge amount of money. The risks involved in such a strategy are, of course, very high because the steeper the pit slope the more likelihood there is of a mine slide. In the late 1990s US Borax suffered such a mine slide at the North end of their mine at Boron and 32 million tons of overburden slid down over the exposed ore (Rio Tinto Borax, 2000).

As a result Borax had to invest heavily in new equipment and engage subcontractors to recover the situation and maintain production. It is an interesting fact that at Rio Tinto's copper mine at Palabora the mine was converted from an open pit mine to an underground mine when it was about the same depth as the mine at Boron. Of course the decision to convert from an open pit to an underground mine depends on many factors but most obviously includes the grade and recoverable tonnage (Allsman, 1972). One of the most important factors to take into account is the forecast world market price of the mineral over the projected extended life of the mine. The fact that Rio Tinto Borax decided against converting to an underground operation at Boron, even though the obvious time to do so was before removing the 32 million tons of overburden from the mine slide, suggests a considerable lack of confidence that the market price of borates can be sustained at the level necessary to justify the investment. The action they did take, to invest

extravagantly to maintain full production, suggests a "make hay whilst the sun shines" approach rather than a more considered long-term investment to secure the future of the mine.

## 6 OTHER INDICATORS

Extracting borates from the ground in California is not the only problem that US Borax is experiencing. It takes almost 600 gallons of water to make one tonne of refined borax. This may be modest compared with the 100,000 gallons required to make one tonne of paper but not many people would choose to site a paper mill in the High Mojave Desert area. Remembering that California is the place that people place bricks in their toilet cisterns to conserve water, it is perhaps another indication of Borax's current short termism that they declined to make a \$24 million investment in a new tailings pond "just to stay in business" (Slavich, 1994).

When US Borax had to remove the 32 million tonnes of rock and earth from the mine slide they had to find somewhere for it to be dumped. The most convenient place was at the top of the haul road near the production plant. This was done without consulting the local community who complained about the dust, noise and visual impact as well as the general environmental impact (Rio Tinto Borax, 2000). There was also a serious issue regarding the effect on the local tortoise population. US Borax managed to avoid returning the spoil to the mine because (they say) there is still economically recoverable calcium borate that may be extracted from the bottom of the pit in the future. The compromise was to dump the spoil on the opposite side of the mine from the township of Boron. Unfortunately it is not very pretty and rather spoils the view from US Borax's private golf course.

The opinion of Rio Tinto's Chairman, Sir Robert Wilson, regarding responsibility for closure costs is intriguing. At the Global Mining Initiative meeting in Toronto he said that rehabilitation costs around the world are "... likely [to be] in the trillions of dollars, and far beyond the capability of mining companies alone to deal with." Presumably Rio Tinto's strategy on "sustainable development" is that, having taken billions of dollars in supernormal profits, they think that the taxpayers across the world should foot the bill for clearing up the mess. Wilson went on to say "...a recent estimate puts rehabilitation costs just in the United States, where regulation is stricter than in many other countries, at \$35 billion." (Reuters, 2002). Considering Wilson's recent intense interest in the subject, how much of

that \$35 billion is attributable to the Borax mine at Boron (and how much is provided for in the Rio Tinto accounts)?

Rio Tinto Borax has, according to "Workers Online", been seeking cost reductions within its worldwide operations of 24% (Casey, 2000). These are largely targeted at "90% compressible costs" - meaning people. Many of the redundancies are in the technical and development areas, and suggest that Borax has given up the "Holy Grail" of looking for a new "breakthrough" application. Insofar as Borax has not really brought a radically new application for borates to market for the last fifty years this may be a sensible decision, but it is again evidence of their short-term business strategy.

## 7 INVESTING IN BORATES

Against this background the Turkish borate supplier, Eti Holdings, is investing heavily in the borate industry. The third production line at Kirka for sodium borate pentahydrate was commissioned in 2001 increasing capacity from 320,000 tpa to 480,000 tpa. In the past Eti has concentrated on supplying natural borates rather than higher value refined borates. This policy is changing as Eti is investing in a new 100,000 tpa capacity boric acid plant due for commissioning in 2003.

Of the other suppliers of borates Russia's JSC Bor is the most significant in terms of both reserves and potential production. The mine is situated at Dalnegorsk in Eastern Russia and, following refurbishment in 2000, was expected to double *bone* acid production and increase the output of other borate products from 100,000 to 140,000 tpa. Unfortunately, ownership disputes (Energomash), together with technical problems, meant that production has dropped significantly in 2001. Given that the boardroom battles will be resolved, the most serious obstacle to the output from Dalnegorsk coming onto the world borate market is transportation. Apart from the distance between the Primorsk region and the major markets, the nearest port to Dalnegorsk, Rudskaya Pristan, is unsuitable for ships other than small coasters (Krasikov, 1999). This means that additional transshipment costs have to be factored into the value chain. On the other hand, if US Borax can move 32 million tons of overburden to keep its borate business alive the new owners at Bor may decide it worthwhile to blast a deeper channel to the port.

The smaller suppliers should not be ignored even though altogether they only make up 15% of the world production. These producers tend to operate in

remote areas in adverse conditions such as high temperatures and altitude. For the most part they are also a long way from the main industrial markets for borates and so transportation costs are high. Although the main borate producers, US Borax and Etimine could reduce prices if they wanted to, these smaller producers are operating on more frugal margins and do not have quite the same flexibility. Having said this, they participate at the moment on the fringes of the main industrial markets and give at least some credibility to a price structure based on cost.

If the price of borates were to fall, sadly the minor producers would be the first to exit the international market. Because their volume contribution is small, in the present oversupply market (Fig. 4), the shortfall could be easily accommodated. In essence these minor players are tolerated providing they "tow the line".

## 8 THE BORATE DICHOTOMY

For the last two years B2o3's message to the borate industry has been "You are paying too much for your borates". In this paper we have considered \$32 million ton mine slides, water shortages, operating at high altitude and transport difficulties. If anything should the customers expect the price of borates to increase? The answer is emphatically "No" to both customers and to suppliers.

The borate market is more or less finite. There is no "Holy Grail" - no major new application to absorb capacity. Even the much-vaunted "Millennium Cell", the sodium borohydride-based fuel system, does not actually consume the borates it uses.

If anything, a large proportion of borate customers are actively looking for substitutes and they will certainly not help the borate producers to look for or develop new applications whilst the price of borates is perceived to be high. In nearly all areas borates, or the end products in which borates are used, can be substituted (Fig.4). Borates in detergents can be replaced by chlorine bleach or enzymes, other glass producing agents such as phosphates can be used in enamels (Roskill, 2002), fiberglass itself can be substituted by long chain carbon compounds or plastics for fabrication or by a multitude of other insulation materials. If borates are not sold at competitive prices to substitutes the industry will kill off its own non-renewable market.

## 9 ANTICOMPETITIVE ACTIVITY

There are strong indications that capacity is restricted and there is collusion on pricing. Whether the price fixing is tacit or active is difficult to prove but more than one academic institution has observed that the borate market does not follow the normal rules of supply and demand. Economic theory is not, however, sufficient to induce the competition authorities to take action. At the moment there are two known formal complaints to the competition authorities, one in France (from a customer) and one in Turkey.

One of the most difficult things to determine for sure in the borate market is the cost of production of each supplier. Much of the economic data available is not reliable and although educated guesses can be made from these figures combined with likely profitability the whole calculation is in danger of

The world demand for borates is being nibbled away by substitutes

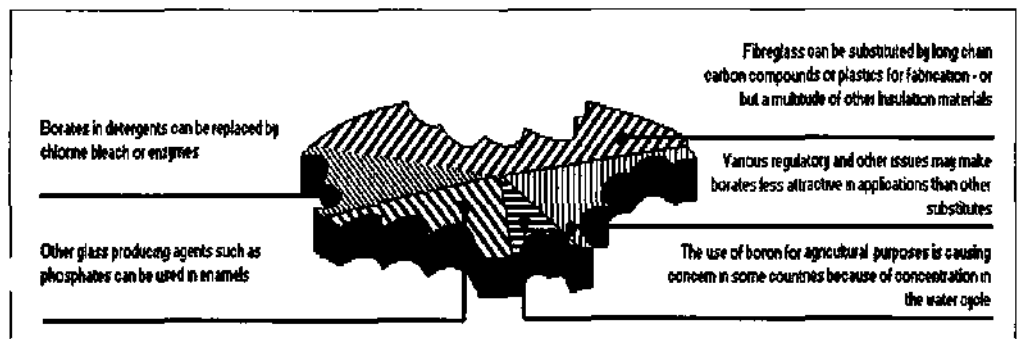


Figure 4. World demand for borates.

becoming slightly circular. There is an MBA programme in Baltimore looking at the subject of borate pricing and there is some PhD research modeling the mining and production costs (Value chain analysis) If the information to create transparency in the market is not fully available now, hopefully it will be in the very near future.

## 10 STAKEHOLDER INTERESTS

So where does everyone stand in this? Essentially there are two camps. There are those producers that have a reducing output or high production costs and those that have increasing output and already have low production costs - or the opportunity to reduce production costs if they want to. Logically the former are short-term stakeholders in the borate industry and the later are long-term stakeholders (Fig. 5)

Borate customers have been classified as long-term stakeholders. Although there are certainly substitutes for boron much of the attraction is price. Boron, for many applications has almost magical properties and, as it becomes more readily available, uses for which it may not be suitable now may be developed in the future.

Elimine, in particular, and JSC Bor, that have large economic reserves and are prepared to invest in the future of borates are in it for the long term. It is in their interest to protect the borate market - and that is not the same as protecting the value (price) of borates. Anybody that is in the borate market for the long-term must try to prevent customers moving towards substitutes. It is an adage when stowing a ship that, if you can stop the cargo from starting to move in the first place, inertia works in your favour but, once it has started to move, momentum works against you. The same is true of customers, and especially if there has been some investment in finding a substitute. You can print all the brochures in the world saying how good borates are but once you have lost the customer to a substitute it is very difficult to win them back.

One factor than influences customer choice, although obviously not the only one, is price. In two hypothetical scenarios the benefits of reducing prices and retaining market have been compared with holding the price as high as possible and allowing the market to erode. In the scenarios put forward the most beneficial outcome for a long-term stakeholder is to implement a pricing strategy that takes slightly less profit in the short-term but is more likely to secure a market for the product (and, hence, increases overall profitability) in the long term.

## Stakeholders in the borate business

Start-term stakeholders	Long-term stakeholders
Rio Tinto Borax	Borate customers
Quiborax	EtibanicEtimine
Incabor	JSC Bor
Lardarello	B2o3

Figure 5. Stakeholders in the borate business.

## 11 MAINTAINING THE MYTH

The commercial director of Borax Europe at one time admitted to subscribing to a concept called "Confusion Marketing". A High Court injunction prevents the author from disclosing the Borax sales strategy but the Feb/March, 1997 Newsletter of the Railroad Passenger Car Alliance, titled "Why the Pullman Company failed" gives a very pertinent illustration of this approach:

A traveler informed a Pullman agent that he wanted a Pullman berth. "Upper or lower?" asked the agent. "What's the difference?" the customer asked.

"A difference of two dollars" replied the agent. The lower is higher than the upper. The higher price is for the lower. If you want the lower, you'll have to go higher. We sell the upper lower than the lower. In other words the higher the lower. Most people don't like me upper although it is lower on account of being higher. When you occupy an upper you have to get up to go to bed and get down to get up. You can have the lower if you pay higher. The upper is lower than the lower because it is higher. If you are willing to go higher, it will be lower."

At this point, the customer walked away and took a cab to the airport

In the context of this paper, such an arrogant strategy in the very finite and inelastic borate market is likely to drive customers towards substitutes.

## 12 DOTOM MENTALITY

The reason that Rio Tinto Borax is trying to hold the value of borates unrealistically high "is not just to do with taking short term profits it is the impact of lower borate prices across all the ore still in the ground. Not only would a drop in prices affect the value of the deposit it would also drastically reduce the amount that could be economically mined.

To illustrate this, if we consider that the price of a mineral falls from one that is held artificially high to one more realistically in line with the equilibrium

price, determined by supply and demand, this might be as much as 45%. In the very simple example illustrated, if this price is then applied to the Surface Mining Costs Curve it could, significantly reduce the size of the deposit that could be mined economically (Fig- 6).

Apart from the fact that the mine life (excluding any consideration for closure costs) might reduce from 80 to 12 years, the devaluation of the asset (for example) in the borate market, and based on an ore value of \$50 per ton, would be in the order of \$3,400,000,000.

This may seem far fetched but at the 2002 Rio Tinto AGM the Chairman, Sir Robert Wilson, had to admit to a loss in the Group's Canadian copper business of \$487,000,000 for exactly this reason (Rio Tinto, 2002). Considering that copper prices (through such markets as the LME) are very much determined by supply and demand it is unlikely that the price used for the book value was unrealistically high in the first place - and so this revaluation could be considered quite meager in comparison with what might be expected in the borate market.

The author submits that in the last few years Rio Tinto has been operated like a dotcom. The directors have seen what can be done with virtually no assets

and have applied the same principles to a company with considerable assets. At the 2002 AGM it was virtually impossible for the shareholders to obtain one set of the detailed accounts before the meeting and Sir Robert Wilson would not allow shareholders to put questions directly to the auditors (PriceWaterhouseCoopers). It is well known that PWC undertake consultancy for Rio Tinto group companies as well as the annual audit - a practice that has been severely criticized recently.

### 13 PROJECT NEBUCHADNEZZAR

Project Nebuchadnezzar is the name given by the "Risk Advisory Group" to how Rio Tinto should deal with B2o3 Limited (and particularly the author of this paper) as competitive threat. Those familiar with the Book of Daniel will know that Nebuchadnezzar is the arrogant king that God decided to banish to the wilderness to go mad and eat grass. This gives a good indication of the strategy that Rio Tinto decided to adopt in June 2000. So far Rio Tinto Borax has "invested" not less than \$1,000,000 (USD) in Project Nebuchadnezzar and has not achieved anything except an injunction not

Impact of fall in long-term sales prices on the economic life of a mine

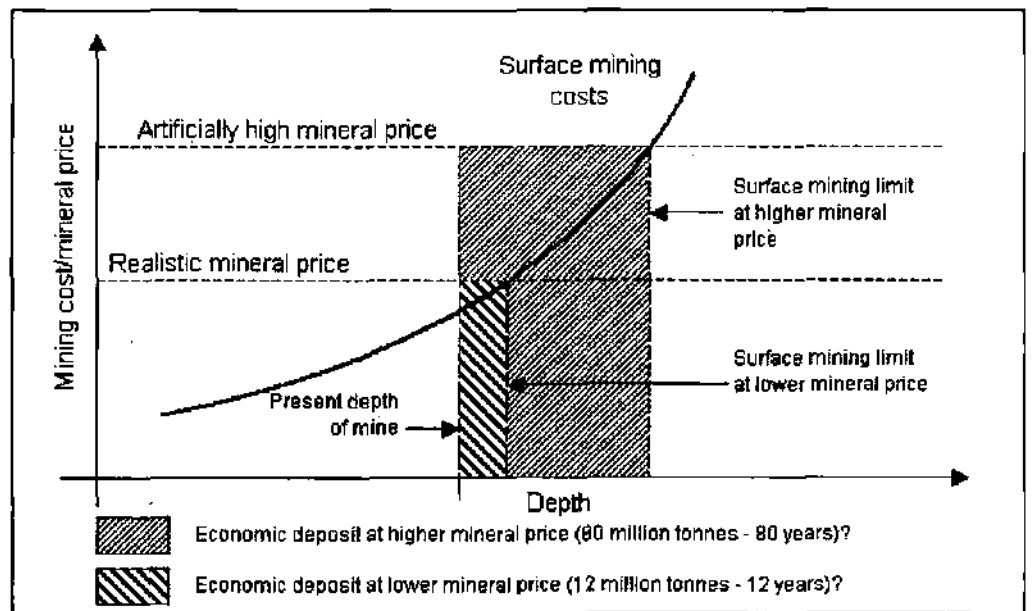


Figure 6. Long-term sales prices on the economic life of a mine

to disclose their "Highly confidential Strategy Plan" (The author of this paper has, of course, abided by the terms of mat injunction to the letter)

## CONCLUSION

The borate industry is at a watershed. It is changing from a suppliers' market to buyers' market. Confusion marketing may work if buyers are ignorant and ill-informed but in the very mature borate market they are not. In an age when anybody can look up how to make a nuclear bomb on the Internet it is insulting to assume that your customer is not well ahead of the game and quite possibly better informed than you are.

Borate suppliers are going to have to be competitive not just in the quality and their range of products but in the product surround. The borate market desperately needs imagination and innovation and this will only happen when and where there is sufficient incentive to find the "Holy Grail" rather than go for a "Borax" lunch. The modern business environment is not compassionate towards dinosaurs - nor should it be. Anyone who thinks that because their business has been successful for the last one hundred years it will be successful for the next one hundred has about the same intellect as a person who chooses the number "43" in a lottery because it has been drawn for the last ten weeks. It is the courage of such pioneers as "Borax Smith" that is responsible for the success of the borate industry (even now) not the luces of Murray, Chiaro and Wilson.

The borate industry has to meet the challenge. It should either find new volume applications or it must be very "nice" to its customers. In any business it is important to choose partners that have similar business aspirations and cost drivers. An unholy alliance between the dominant players in the borate market may be attractive to some in the short term but there will be heavy price to pay for others that invest heavily and have no volume market in the long term.

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