The soda ash industry is not known for periods of intense activity, but that is just what has happened over the last few months. The bottom line is that market demand is outstripping supply in certain areas, especially in Asia, which has seen prices increase and soda ash availability remain tight.

Producers, most of which are working plants to high operating rates, are looking at all options to secure more capacity to meet this demand boom. This has sparked a spree of acquisitions and capacity expansions the world over.

Indeed, of the five US soda ash producers, only FMC remains domestically owned, with the others having attracted foreign ownership from Solvay SA, Belgium (Solvay Chemicals Inc.), DC Chemical Co., South Korea (OCI Chemical Corp.), Tata Chemicals Ltd, India (General Chemical Soda Ash Partners), and Nirma Ltd, India (Searles Valley Minerals Inc.).

**Acquisition & expansion**

Since 2005, Indian soda ash players have acquired significant sources in Europe and Africa, and most recently in the USA (see below for detail).

Giech SA of Poland has just expanded into Germany with its purchase of Sodawerk Stassfurt GmbH, following its majority stake acquisition of Uzinele Sodice Govora SA, Romania.

Meanwhile, Turkey’s Soda Sanayii AS (Sisecam Chemicals Group) is apparently bidding for Egypt’s Alexandria Sodium Carbonate Co., having just completed its investment in joint venture Sisecam Soda Lukavac doo, in Bosnia (which has further investments planned for 2010).

FMC Wyoming Corp. recently announced plans to recommission the rest of its Granger facility (ex-Tg Soda Ash), currently operating at 500,000 tpa. An initial increase of 100,000 tpa will start in 2009, with an additional 700,000 tpa added in increments to 2012. OCI also has some mothballed capacity that could also see the light of day in present market conditions.

Elsewhere, TCL continues to pursue its...
Lake Natron, Kenya 500,000 tpa project, currently held up over local protests, and is eyeing Oman as another potential new plant site. The Magadi Soda Co. capacity expansion which would bring total capacity to 365,000 tpa is not expected to be fully on stream until mid-2008.

Other new capacity earmarked to come on stream includes a 1m. tpa natural soda ash plant in Beyapazari, Turkey, 50% is reported to be expected operational by 2009. It is generally considered that more capacity will be added in China.

Meanwhile, Rio Tinto Plc is continuing to evaluate trona deposits in Kazan, Turkey, but given the group’s situation with BHP hovering in the wings and its already initiated industrial minerals divestment programme, the future of this project is uncertain.

**Demand growth**

So where is this demand coming from? The accompanying panel (see p.57) outlines the main markets for soda ash, and it is really the glass market which is driving soda ash demand in Asia and South America. The detergents market is also important, and more so in Europe.

K.K. Jand, vice president marketing of Nirma Ltd, India’s leading producer, told IM: “Demand is good in India, and we are getting higher prices for our exports than domestic prices. Glass and detergents are the main markets, each taking 40% of [Indian soda ash] output. But glass growth is stronger, around 9-10%.”

“Glass demand has picked up in India, and in the future, glass only will determine the soda ash industry” said Vajay Sharma, general manager global exports of GHCL.

CMAI forecasts that world demand growth through 2012 will exceed GDP growth, and will be led by flat glass driven by construction and automobile markets.

Other buoyant market outlets include soda ash applications in metal mining (as a flux in mineral processing), which is still enjoying a prolonged boom period. Australian soda ash producer Penrice Soda Holdings Ltd has recently gained contracts for supply to regional vanadium and nickel processing plants. Penrice forecasts double digit growth for soda ash over the next five years, especially driven by flat and container glass in developing regions such as China, Asia, the Middle East, Eastern Europe, and South America.

Prices are expected to remain high. Last year, FMC announced two successive $15/ton increases in May and September, in response to market conditions. In November 2007, Searles Valley Minerals increased its off-list price for bulk and bagged soda ash by $20/tonne. At time of press, prices for large contract rates, bulk FOB Wyoming, dense, were 180-200/tonne.

According to the USGS, the value of US soda ash output in 2007 pushed through the $1,000m. mark for the first time, increasing from $928m. in 2006 to $1,300m. in 2007. Almost 50% of the USA’s 11.1m. tonnes produced in 2007 was for export markets, which are expected to retain strong demand for the near future. Asia receives monthly shipments of some 100,000 tonnes soda ash from the USA.

Prices rose substantially for soda ash exports to Asia (up by $25/tonne) and South America (up $40/tonne). Prices of Indian soda ash rose by a massive $60/tonne towards the end of 2007.

Weather conditions have also played their role in compounding the supply squeeze, with excessive rain and floods disrupting Indian producers in late 2007, and at Botswana Ash (Pty) Ltd, Botswana, in early 2008.

Early 2008 harsh winter conditions caused delays in railcar deliveries in Wyoming, USA and wreaked havoc in China causing soda ash delivery problems and pushed prices up. Combined with buoyant market demand, contracts for soda ash were reported at $230-300/tonne CIF Asia in early 2008, these were expected to rise past $350/tonne CIF Asia by April 2008. Chinese spot prices for soda ash in mid-March 2008 were in the order of $265-275/tonne.

World market conditions appear to favour the US producers, which are pretty much sold out. Chinese producers have become less competitive as domestic demand has risen and a 13% export tax rebate was abolished in mid-2007. Also, China’s synthetic soda ash costs more to make than the natural soda ash produced in the USA.

The outlook is that although Chinese capacity may increase, its effectiveness in the global market maybe stifled by a series of factors: energy cost increases; environmental pressures; tightening credit and lending practices; the upward revaluation of the Chinese RMB; and recently, rumours of export duties being implemented for soda ash exports (which has already come to fruition for a range of Chinese industrial minerals including magnesite, graphite, bauxite, and fluor spar).

**Indian expansions – home & away**

One of the most startling developments of the recent soda ash activity has been that of the Indian soda ash industry’s strategy in securing overseas soda ash capacity.

It all started in 2005, when TCL acquired Brunner Mond Plc of UK, through which it also bagged Magadi Soda Ash Co., Kenya (365,000 tpa). In the same year, Gujarat Heavy Chemicals Ltd (GHCL) acquired SC Bega Upsom of Romania (300,000 tpa).

Come 2008, the USA was firmly on the Indians’ radar as Nirma Ltd acquired Searles Valley Minerals Inc.; pictured here Searles Lake, California, source of a variety of mineral salts including trona.
Soda Ash Partners), which it expects to conclude in April 2008.

At the same time, TCL and GHCL also announced major domestic capacity expansions: TCL to expand from its current 0.864m. tpa to 1.2m. tpa by 2010 at its plant at Mithapur, Dwarka, Gujarat; and GHCL to add 250,000 tpa during fiscal 2010 to its 650,000 tpa plant at Suratpada, Gujarat.

At present, India’s leading producer is Nirma Ltd with 1m. tpa (after its 2006 acquisition of Saurashtra Chemicals), followed by TCL (0.864m. tpa) and then GHCL (0.65m. tpa).

The soda ash capacities recently acquired in the USA will bring GHCL a further 2m. tpa and TCL 2.6m. tpa.

Natural attraction

So why the shift to natural soda ash producers? Dennis Kostick, Senior Mineral Commodity Specialist, USGS, told IM: “Now the major synthetic producers have seen the advantage of mining soda ash and have gone from minor partnerships with US firms to becoming outright majority shareholders of some of them.”

It is abundantly clear the search is on for natural soda ash sources by the leading Indian soda ash producers. K.K. Jand, vice president marketing of Nirma, explained to IM: “The future of synthetic soda ash in India is not good. Input costs are rising, especially coal and coke, which has risen three times in the last six months. The cost of synthetic soda ash is very high. We now aim to be the world’s number one in natural soda ash production.”

In addition to coal and coke, synthetic soda ash’s other main input costs are salt and limestone. Jand acknowledged that shortages in these two commodities were also a factor in pushing them towards natural soda ash options. Nirma is experiencing a shortage of chemical grade limestone in western India, and is having to import some of its requirements from Oman.

The situation with salt supply is that soda ash producers have to compete with the domestic chlor-alkali market which has increased its consumption of salt, thus squeezing salt supply.

Vajay Sharma, general manager global exports of GHCL, told IM: “Next, GHCL will be putting up prices to counter rising costs.” Sharma said he was not surprised that TCL and Nirma had sought US natural soda ash acquisitions, but would not be drawn on GHCL’s plans for natural soda ash (the company produces synthetic soda ash only at present).

Sanjay Dalmia, chairman and managing director of GHCL, told India’s Business Line in January this year that the company aimed to acquire a company each in the USA and China – “We hope to clinch the deal this year,” he was reported as saying.

It is understood that GHCL was in the running for SVM, but was pipped by Nirma. GHCL was also interested in a stake in Romania’s other producer Uzinele Sodice Govora SA, but Ciech SA acquired a majority stake in late 2006 (see p.54 for Tata’s views on the soda ash market).

General Chemical: a natural choice

General Chemical (Soda Ash) Partners (GCSAP) is one of the four companies mining trona from the Green River Basin in south-west Wyoming. GCSAP is exploiting a 67,000m. tonne trona deposit and producing soda ash for the glass, chemicals, soaps and detergents, and pulp and paper markets.

At present, GSCAP is mining some 4.6m. tpa of trona from which it processes around 2.6m. tpa soda ash.

In late February, IM was fortunate enough to be granted a visit to the company’s Green River operation during this busy period, and witnessed a world class natural soda ash facility in action that has been targeted by the world’s second largest soda ash producer, TCL of India.

GCSAP is jointly owned by General Chemical Industrial Products Inc. (GCIP; 75%) and Owens-Illinois Inc. (O-I; 25%). The latter, based in Toledo, Ohio, is one of the world’s largest consumers of soda ash and is the world leader in container glass manufacture.

GCIP is majority owned by the hedge fund group, Harbinger Capital Partners, of New York, USA, which acquired GCIP in 2004. However, on 31 January 2008, the second largest soda ash producer in the US, Harbinger agreed to a deal with the world’s largest consumer of soda ash to acquire GCIP. The transaction was expected to be concluded in mid-April.

Although the move by TCL may have surprised a few at GCIP, despite the current trend for Indian soda ash producers securing overseas sources (see earlier), on evidence of a recent visit to GCSAP by IM the Indian takeover appeared welcome.

This is perhaps in no small part due to the propensity of hedge funds as well as private equity groups to sell their acquisitions within a few years of securing them – and there have been plenty of examples in the industrial minerals business of late (eg. Almatis from Rhone Capital to Dubai International Capital).

Thus, with all respect to Harbinger, which actually further diversified into the industrial minerals world in late 2007 by buying US Silica Co. (see IM December ’07, p.9), GCSAP clearly feels more comfortable under the wings of a serious soda ash player in the form of TCL.
Of course, GCIP itself also had ideas, short-lived as it turned out, on expanding beyond soda ash and picked up the former Zemex Industrial Minerals Inc. assets of muscovite mica, phlogopite mica, and attapulgite in late 2007 (see IM December '07, p.9). Unsurprisingly, the TCL deal did not include these assets, which are widely expected to be placed on the market again by Harbinger.

With the GCSAP buy, the Indian’s have gained a world class natural soda ash producer to complement TCL’s Magadi, Kenya natural soda ash (through Brunner Mond, UK) and its domestic synthetic soda ash facilities.

**Green River Basin**

The world’s largest natural deposit of trona was discovered at Green River by accident in January 1938 when Mountain Fuel Supply Co. was drilling for oil and gas, and core sample analysis verified the presence of trona.

The first mine shaft (460 metres) was sunk in 1947 by Westvaco Chemical Corp., which began active mining later that year before merging with FMC Corp. in 1948. Later, other companies began to exploit the basin: Stauffer Chemical Co. in 1962 (now OCI Chemical Corp.), Allied Chemical in 1968 (now GCSAP), Texas Gulf in 1977 (now FMC, Granger), and Tenneco in 1981 (now Solvay Chemicals).

The Green River Basin trona deposit covers more than 3,100 km² and is the result of repeated evaporation of Lake Gosiute, a freshwater lake that formed in the Eocene epoch. The Wilkins Peak Member (around 420 metres thick) of the Eocene Green River Formation contains 42 trona beds, of which 25 exceed 1.22 metres in thickness and 175 km² of area.

The beds that are currently mined (17, 19, 20, 24, and 25) contain 85-95% trona, less than 15% insolubles, and less than 0.5% chloride, at depths ranging from 240-520 metres. The total resource is estimated to contain 127,000m. tonnes of trona in 22 beds greater than 1.22 metres thick.

**GCSAP production**

GCSAP’s underground mine is serviced by two shafts which descend 488 metres to an underground tunnel network of some 52 km². There are three working faces which are exploited using room and pillar mining consisting of long cuts connected at about 100 ft intervals by repeated cross cuts.

Mining is conducted by rotary shears and bore miners, and trona drops onto a flexible conveyor train (FCT) that carries the ore to the overhead conveyor. An ore stockpile is maintained on the surface.

GCSAP’s enjoys an estimated recoverable trona ore reserves of approximately 100 years based on current operating rates. Both the mine and plant operate around the clock, all year.

The mined trona ore is precision crushed and screened to prepare it for processing. GCSAP uses the monohydrate process to produce soda ash from trona, with about 1.8 tonnes of trona yielding 1.0 tonne of soda ash.

The crushed trona is heated in a rotary kiln to drive off unwanted gases. This heating process transforms the ore to crude sodium carbonate. Water is added, the crude sodium carbonate is dissolved and the resulting solution is filtered to remove impurities.

Water is then evaporated from the purified solution to form a soda ash crystal slurry. Any remaining water in the slurry is separated from the soda ash crystals in a centrifuge. The soda ash crystals are then sent to rotary driers.

After screening, the finished soda ash is sent to storage bins (some 60,000 tonnes maybe stored) until it is loaded for shipment via truck and railcars (GCSAP leases a fleet of rail cars).

Over the years, GCSAP has had three successive plants built on its site in order to match market demand, as synthetic soda ash production capacity elsewhere in North America closed.

Crucial to the plant is energy in the form of steam, and GCSAP has developed its own in-house source on which it is self-reliant, primarily driven by two coal-fired boilers (approximately 75% of steam generation) and one gas-fired boiler.

Exhaust steam from two turbine generators is directed to process evaporators for the crystallising and drying of soda ash. GCSAP produces a standard grade dense soda ash, whose properties it can fine tune to meet certain customers’ requirements.

Soda ash crystals towards the end of the process route at GCIP’s plant, undergoing dewatering before drying.
Other grades include low chloride, low TOC, and food grade soda ash.

Markets

GCSAP serves both the domestic and overseas soda ash markets, and is a member of the American National Soda Ash Co. (ANSAC). TCL has already made clear that it is the export markets which hold its greatest interest for GCSAP output, particularly the glass markets of Asia and Brazil.

De Lyle Bloomquist, chief executive officer of GCIP told IM: “About 50% of our sales volume is exported outside the USA to serve the main markets of container glass, flat glass, chemicals, detergents, water treatment, and flue gas desulphurisation.”

Naturally, the company has a long term contract to supply its 25% shareholder O-I which produces container glass. Adjacent to GCSAP is Church & Dwight Co. Inc.’s Specialty Products division, the largest sodium bicarbonate producer in North America, which consumes soda ash primarily supplied from GCSAP.

The flat glass market is driven by construction and automobile manufacture. “Even when the housing market is down, as it is in the USA at present, there is still relatively strong demand from the remodelling market.” said Peter Kalivas, vice president, manufacturing, GCSAP.

Saudi Arabian joint venture

Outside the USA, GCIP has entered into a joint venture with S&amp;A Abalsain Co. Ltd, of Saudi Arabia, to construct a 1m. tpa soda ash operation in Saudi Arabia.

Tata’s take on soda ash

During a recent visit to India, Alison Tran, Asia Correspondent IM, talked with Zarir Langrana, head of Strategy and Business Development at Tata Chemicals Ltd (TCL), Mumbai.

The company is India’s second largest soda ash producer, purchased Brunner Mond, UK in 2005, and very soon is expecting to close a $1,005m. deal to buy US natural soda ash producer, General Chemical Industrial Products Inc.

What are the major markets for your soda ash?

Demand for soda ash in India is growing at a very healthy rate of 5-6% per year. Unlike the rest of the world where glass is the major market for soda ash, in India the major market is still detergents.

This market accounts for some 40-45% of production versus 20-25% for glass.

That said, the market for soda ash for glass production is growing at a much faster rate, whereas the detergent market has a much more modest rate of growth. This is tied to the developments taking place in infrastructure in India which is rapidly developing across a number of levels with increases in the construction of residential, retail complexes, airports and so on.

What is your position in terms of raw materials & inputs for soda ash production?

We produce in total 2.5m. tpa of industrial salt, and we are a very small player in terms of the markets we serve, as most of the salt we produce is used to feed our soda ash plants. We also produce some 0.5m. tonnes of salt for human consumption (eg, iodine) for which we have the largest market share in India. The salt we produce is really soda evaporated salt (versus mined salt) and this is produced in Gujarat, next to our soda ash plant.

In terms of other raw materials, we have access to local limestone, and we have long term contracts for coal and coke. We also have our own co-generation power plant. It is true that we did experience some constraints in limestone supply about 15 months ago but this has now cleared up.

About that time, we started looking into alternative sources and actually began importing small amounts from the Middle East, but that has now stopped. Essentially, we came to the conclusion that it is by far more cost effective to source locally and thereby, most importantly, ensure a reliable source of supply for our plants.

What is the rationale behind the location of your plants?

All soda ash plants with one exception in India are located within a maximum distance of 300km from each other in the state of Gujarat. Essentially, that is because this is where the limestone deposits are located. The Indian railway system is very well developed and we have a fairly decent coastal network of shipping from west to east. We thus ship short leads by road, and long leads by railway and by sea. Most soda ash consuming units have thus naturally sprouted up near the soda ash plants in the west.

Why did Tata decide to acquire General Chemicals?

Over the years we have been looking at ways to broaden our production base, and gain some portfolio share in the production of natural soda ash to better serve global markets. We effectively carried out an opportunity scan looking at possibilities of entering alliances, starting up a new Greenfield operation, and making an acquisition.

We have over the years been expanding globally. In 2005, we acquired Brunner Mond and Magadi Soda in Kenya which gave us a position in the natural soda ash market for the first time out of Kenya.

It is extremely important for us to have a position in natural soda ash, which makes us better positioned to serve the US market. It is not a question of quality. The cost of natural soda ash may be higher than synthetic soda ash but that is really irrelevant. What is relevant is the final delivered cost to the end customer.

Up till now, we have not shipped into the US market because it has simply not been competitive for us. The freight costs are so high and then you have to take it inland, and that delivered costs compared with material made of natural soda ash is simply uneconomical.

(continued on p.54)
The acquisition thus gives us access to the US domestic market and attractive export markets that the US serves. We have not only gained access to the North American market for instance but also Latin America which is another very high growth market.

It is too early to say if we have plans to increase capacity at General Chemicals. Demand for soda ash globally is running at a very healthy rate so it is inevitable that an increase will happen over time, although where and when remains to be determined.

**Does Tata foresee a slowdown in demand should a recession in the US materialise as forecast?**

Demand growth is so strong for soda ash currently that any downturn, if it does happen in the US market, means that any “spare” soda ash volumes can be diverted to other markets in Latin America or South America that are crying out for soda ash. We don’t anticipate a downturn in growth rates in any particular economy to severely undermine demand.

It is true that US soda ash producers struggled during the South East Asia downturn some 6-7 years ago, but today they are well run, efficient, operations.

A big challenge in recent years has been competition against cheap imports from China, but producers in China are facing challenges similar to producers anywhere else in the world – such as availability of raw materials, rising input costs, greater environmental considerations and that will continue. China is helped by their own domestic market which is showing very healthy signs of growth.

**How would you describe current pricing levels?**

Prices are admittedly high but input costs have gone up substantially, and I don’t think margins have increased necessarily. One of the key dynamics is supply and demand. Over the medium and long term, for an organisation to provide a steady service to customers, we have to make sure our operations are viable. It is true that the cost of inputs over the last 12 months have really gone out of control, and prices are reflecting that naturally.

It is tough to say what the current price for soda ash is as there is a variation between contract and spot pricing. In the market, availability of material is a greater concern than actual price. Current prices for material arriving into India are about $320/tonne and above (CFR India) that would be for material arriving from China, Kenya and Eastern Europe.

Those prices are changing almost every month. Consumers who are locked into contracts for this year price might be paying $270-300/tonne (CFR India). Indian exports have come down substantially because domestic demand is so strong, and availability is so tight. We base our prices in India on import parity meaning that we take the import price and base our prices on that.

These days, Indian prices reflect global prices. We get our pricing data from customs, customers, market intelligence; it’s fairly transparent.

**What is the current status of operations at Magadi & Brunner Mond, operations you acquired in 2005?**

Our plant in Magadi is now operating at near-to-design capacity (ie. 700,000 tonnes). The rail link between the plant and port has its constraints and we’re trying to sort that out. The rail line was privatised a few years ago and the change in ownership we consider positive. It is a rail line that has been used for decades. Product is shipped to Africa, the Middle East, India and South East Asia.

All businesses are under pressure because of raw materials and other basic inputs. In Magadi we don’t generate our own power; we buy power. Kenya has had a rough patch certainly and this has added to the pressure there; but it has not materially affected our business.

Magadi Soda has been around for so long and it has such a positive reputation in the region, helped by corporate social responsibility initiatives that have been undertaken, and it is considered a very important part of the local economy and community. We don’t believe there’s a political risk.

At Brunner Mond, the focus has been on improving efficiency, reducing costs and making sure that the operation is sustainable over the long term. We have also focused on deepening our relationships with European customers that have operations in other parts of the world which we can now service out of our manufacturing centres.

We have also endeavoured to share best practise across sites. Some of our Indian operations have benefited from the technology that the acquisition of Brunner Mond endowed us with, and vice versa.

**How do prices & costs in your European operations compare with elsewhere?**

European prices have traditionally tended to be marginally lower than in other parts of the world. Now that the market is snug, all prices tend to level out. The major cost issue with European soda ash producers is tied to coal and coke. Coal is sourced from Europe for our European operations.

The European market has tended to be tilted towards long term contracts, and Indian market tilted toward spot purchases of soda ash. Global customers we service from India are dealt with on a contractual terms which are typically short to medium term contracts.

The American market has traditionally been contract-based. It is true that the spot market is much more lucrative but you need to balance out the needs of producer and consumer.

The Indian market is composed of an equal amount of spot and contract purchases. Historically, the Indian market has been close to 80% spot but as consolidation has taken place and as relationships with customers have grown, that percentage has changed. That said, contract purchases in India are not 3-5 years as is the case elsewhere, they are still much more short term.

The appreciation of the Indian rupee against the US dollar has tilted the balance of trade somewhat. We haven’t felt it all that much in finished products because the market is running extremely tightly but it certainly does make a difference to competitiveness.

**What are your future plans for growth?**

We have not completely ruled out investing in a greenfield operation. At some stage that may happen. It could be Asia, the Middle East, or Africa, ie. in a region well positioned to serve high growth markets. Notably there is no plant positioned between India and Africa. Latin America has a small producer in Argentina.

Essentially, growth is something we continue to focus on, where that growth will come from remains to be seen. Our growth agenda continues to ultimately focus on providing best value to our customers, and providing innovative ways of delivering value to customers.
Soda ash basics

Soda ash is a white, anhydrous, powdered or granular material containing more than 99% sodium carbonate (Na₂CO₃) when shipped. The accepted commercial standard for soda ash is expressed in terms of the equivalent sodium oxide (Na₂O) content. A 99.5% soda ash is equivalent to 58.2% Na₂O (the conversion equation is: % Na₂CO₃ x 0.585 = % Na₂O).

Soda ash is made in three main grades: light, intermediate, and dense. These differ only in physical characteristics, such as bulk density and particle size and shape (which affect flow characteristics and angle of repose). Other physical and chemical properties are common to all grades, whether in solid or liquid form.

A typical Green River, Wyoming dense soda ash grade will contain 99.9% Na₂CO₃, 0.0066% NaCl, 0.012% SiO₂, 0.0038% organic matter as C; 64.4 lbs/ft³; particle size range by cumulative weight %, on US30 (600 μm), 1.2%, US100 (150μm), 92.3%, US200 (75μm), 1.0%.

Soda ash is used in glass (its largest market), as feedstock for a range of chemicals (sodium bicarbonate, caustic soda the most significant), soaps and detergents, flue gas desulphurisation, pulp and paper, and water treatment (see chart).

Production

Soda ash maybe produced in two ways:

1. processing of natural soda ash bearing minerals (trona, nahcolite, sodium carbonate rich lake brines); this can utilise conventional mining, solution mining, or brine concentration methods depending on the ore source; the monohydrate (mainly used) or sesquicarbonate process is used to exploit trona ore.
2. synthetic production of soda ash through one of three methods:
   a. Standard Solvay process: or the ammonia process, requires good sources of limestone and coke to produce soda ash from solution-mined rock salt.
   b. Modified Solvay process: uses the ammonium chloride step, in place of the lime kiln and the ammonia recovery step, meaning that limestone is not required, salt utilisation is greater, and effluent generation is lower.
   c. Dry liming process: developed by Akzo Nobel, utilises the heat created from hydrating the dry lime, reducing energy costs. As the dry lime is hydrated, steam is produced, which is used to drive of the ammonia and carbon dioxide from the solution

Natural soda ash is produced in Kenya (Magadi Soda Co., trona, 365,000 tpa), Botswana (Botswana Ash (Pty) Ltd, lake brines, 250,000 tpa), and by several companies in Inner Mongolia (trona).

Elsewhere, soda ash is produced synthetically in Asia, Australia, Europe, the Middle East, and South America.

Recent USGS data estimated total world soda ash production for 2007 at 11.7m. tonnes natural soda ash, and 31.3m. tonnes synthetic soda ash – giving a total of 43m. tonnes.

Top ten world soda ash producers

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<tr>
<th>Company</th>
<th>Operation location(s)</th>
<th>Soda ash source</th>
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<tr>
<td>Solvay SA</td>
<td>Europe</td>
<td>synthetic</td>
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<tr>
<td></td>
<td>USA</td>
<td>trona</td>
</tr>
<tr>
<td>Tata Chemicals Ltd</td>
<td>India</td>
<td>synthetic</td>
</tr>
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<td></td>
<td>UK</td>
<td>synthetic</td>
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<tr>
<td>FMC Corp.</td>
<td>Kenya</td>
<td>trona</td>
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<tr>
<td>Nirma Ltd</td>
<td>USA</td>
<td>Lake brines</td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>synthetic</td>
</tr>
<tr>
<td>Ciech SA</td>
<td>Poland, Germany, Romania</td>
<td>synthetic</td>
</tr>
<tr>
<td>JSC Soda</td>
<td>Russia</td>
<td>synthetic</td>
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<td>General Chemical Soda Ash Partners</td>
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