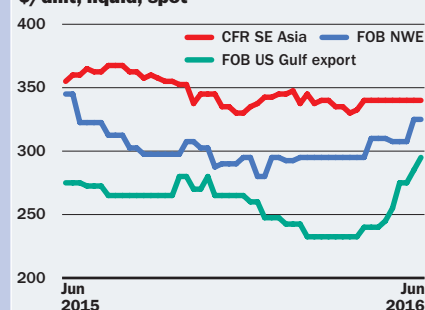


CO-PRODUCT CAUSTIC SODA

GLOBAL CAUSTIC SODA

\$/dmt, liquid, spot



CAUSTIC SODA PROJECTS

COMPANY, LOCATION	CAPACITY**	START-UP
Shintech, US	100	Q2 2016
Shintech, US	100	Q4 2016
Ercros, Spain	33	2017
OJSC Navoiyazot, Uzbekistan	75	2018
Long Son Petrochemical, Vietnam	280	2019
Ercros, Spain	15	By 2020

**'000 dry metric tonnes/year

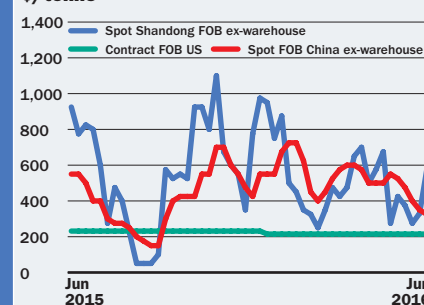
- Used in pulp and paper, alumina, textiles, commercial goods and chemicals.
- Over 1m DMT/year of Europe capacity at risk or closed due to phase-out of mercury cell technology at the end of 2017.
- May shorten market slightly but there is still expected to be sufficient capacity.
- Europe imported 15% more in 2015 over previous year.
- US production driven largely by chlorine demand for polyvinyl chloride (PVC).
- US domestic demand for liquid caustic soda is largely steady in a mature market.
- Growth of US PVC capacity linked to shale gas has kept supply long.
- Asia prices affected by spot supply in northeast Asia, especially China which has largest export volumes and can influence spot prices.
- When chlorine prices are abnormally low or high, they affect caustic soda operating rates and prices.

FEEDSTOCK CHLORINE

- Co-product of caustic soda. Used for PVC, isocyanates, epichlorohydrin plus inorganic and solvents.
- Produced from brine via electrolysis: membrane, diaphragm and mercury cell technology.
- Mercury cell being phased out in Europe by December 2017, resulting in cuts to European capacity.
- Highly corrosive so made mainly for captive use, not widely traded.
- US production has grown along with the growth of back-integrated PVC production capacity to take advantage of cheap US ethane.
- But more expensive freight costs, fears over safety plus cutbacks in US production of some chlorine derivative chemicals have hurt demand and threaten price stability.

US AND ASIA CHLORINE

\$/tonne



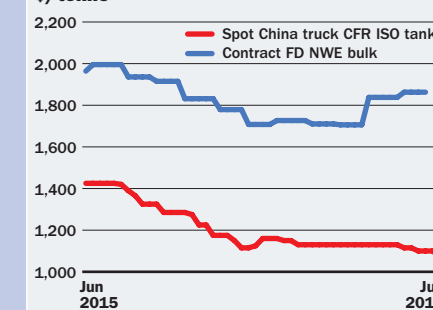
CHLORINE PROJECTS

COMPANY, LOCATION	CAPACITY*	START-UP
Shintech, US	91.5	Q2 2016
Shintech, US	91.5	Q4 2016
Vencorex, France	110	2016
Ercros, Spain	30	2017
Evonik, Germany	82	Q3 2017
OJSC Navoiyazot, Uzbekistan	68	2018
Ercros, Spain	14	By 2020

5% DERIVATIVE EPICHLOROHYDRIN

EU, ASIA EPICHLOROHYDRIN

\$/tonne

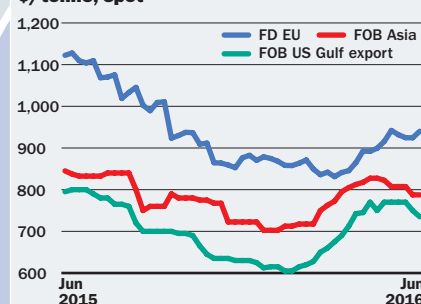


- Around 90% is used for epoxy resins so demand shifts heavily influence ECH. End uses of epoxy resins include coatings, paint and adhesives. Other downstream applications for ECH, such as water treatment and paper treatment, also influence ECH demand.
- Key feedstock propylene remains a driving factor in ECH price movements in Europe. However, some producers have moved away from propylene and are instead using glycerine. The move is seen as offering both financial and environmental benefits, although ECH in Europe is predominately produced using propylene.
- China domestic spot crucial to the liquidity of CFR China main port market.
- Wide buy-sell gap to curtail trades in the CFR China main port spot market.
- Weak downstream Asia epoxy resin demand to weigh down ECH spot market.

34% DERIVATIVE PVC

GLOBAL PVC

\$/tonne, spot



PVC PROJECTS

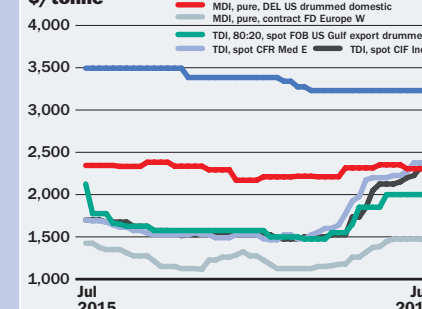
COMPANY, LOCATION	CAPACITY*	START-UP
Shintech, US	150	Q2 2016
Shintech, US	150	Q4 2016
Hegmataneh Petrochemical, Iran	48	2016
Shenyang Paraffin Chemical, China	70	2016
Xinjiang Xiangyun, China	600	2016
Ningxia JinYuyuan Chemical, China	240	2016
Inner Mongolia Valley Mining, China	300	2016
Vestolit, Germany	40	2017

- Used in construction, the automobile industry, wires and cables, for medical devices, flooring, films and sheets.
- Europe demand linked to construction and economy. Still below pre-crisis peak.
- Phase out of mercury cells means several sites could close.
- Ercros will continue PVC production at its Vila-Seca, Spain, site despite associated chlor-vinyl closure, using imported feedstocks. Others could follow suit.
- US has increased capacity targeting export markets.
- Slow rebound from credit crisis has kept the market muted compared to early 2000 bubble years.
- Key driver for Asia prices are export prices of carbide-based PVC from China.
- India is the most important market for Asian producers due to high netbacks and the country's large import requirements. When Indian demand is poor, such as during the monsoon season, or when sentiment is bad, prices fall.

29% DERIVATIVE ISOCYANATES

GLOBAL ISOCYANATES

\$/tonne



ISOCYANATES PROJECTS

COMPANY, LOCATION	CAPACITY*	START-UP
MDI		
Sadara Chemical, Saudi Arabia	400	Q1 2017
Huntsman Polyurethanes, China	240	2017
Kumho Mitsui Chemicals, South Korea	100	2017
TDI		
Sadara Chemical, Saudi Arabia	200	Q1 2017
Yantai Wanhua Chemical, China	300	2017
Gansu Yinguang, China	80	2018

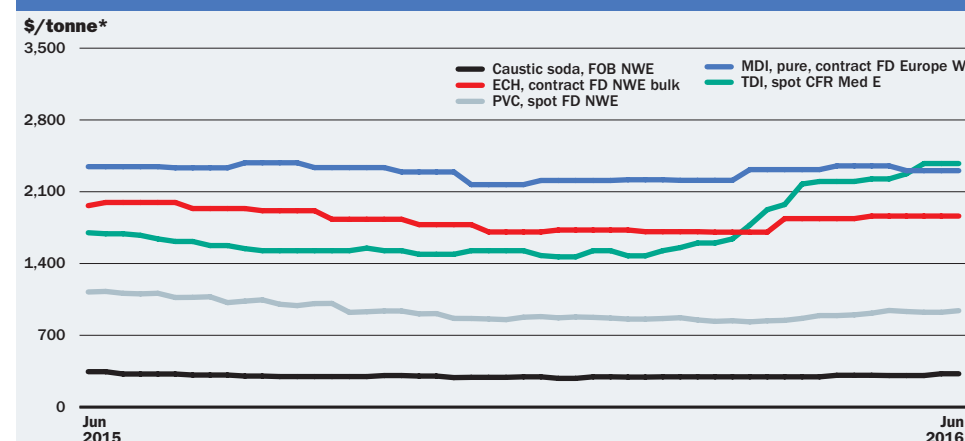
- Isocyanates are reacted with polyols to form polyurethanes. Polymeric (crude) methyl di-p-phenylene isocyanate (MDI) goes into construction and automotive.
- Toluene di-isocyanate (TDI) is used with flexible polyols to make foam for furniture and upholstery, plus automotive seating.
- Covestro will shut its 170,000 tonne/year MDI plant in Tarragona, Spain, by the end of 2017, reducing competition and structural market length.
- Moderate growth projected for TDI and MDI in the US, as both are mature.
- MDI spot import prices in Asia trend flat, rising from multi-year lows in 2016.
- TDI spot import prices in Asia will likely moderate beyond July when northeast Asian plants return from turnarounds. Average prices have surged by over 40% from first-half March to late-May amid persistent tight regional supply.
- Closure of Mitsui Chemicals & SKC Polyurethanes' 120,000 tonne/year TDI plant in Kashima, Japan, has further tightened supply.

COORDINATED BY:
GLOBAL LEAD
CHRIS BARKER LONDON
CAUSTIC SODA, PVC
KITE CHONG SINGAPORE
CHLORINE, CAUSTIC SODA, PVC
BILL BOWEN HOUSTON
ISOCYANATES, PVC
RON COIFMAN HOUSTON
ISOCYANATES, PVC
DESMOND ANG SINGAPORE
ISOCYANATES
MATTHEW CHONG SINGAPORE
ISOCYANATES
JO PITCHES/BEN LAKE LONDON
EPICHLOROHYDRIN
JOSON NG SINGAPORE
EPICHLOROHYDRIN
LUKE MILNER LONDON

*Capacity '000 tonnes/year

CHLORINE VALUE CHAINS BY REGION

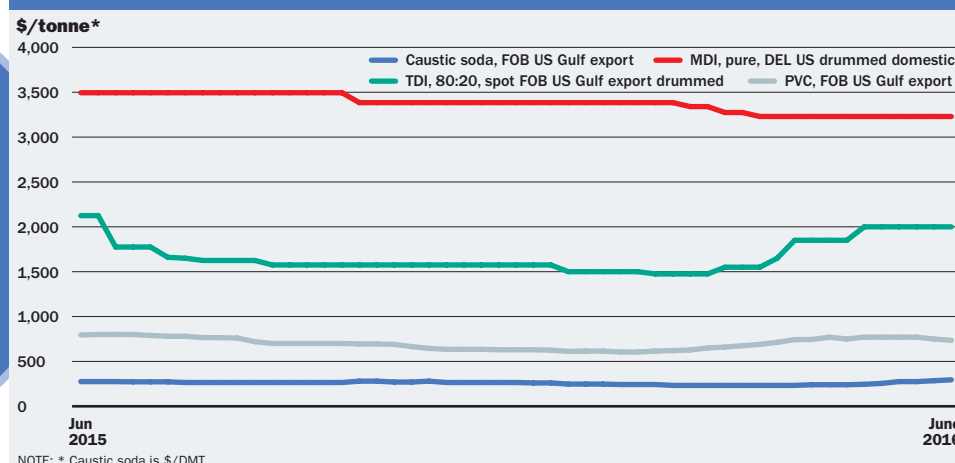
CHLORINE VALUE CHAIN - EUROPE



+16%

Price recovery of Europe caustic soda prices from their 52-week low

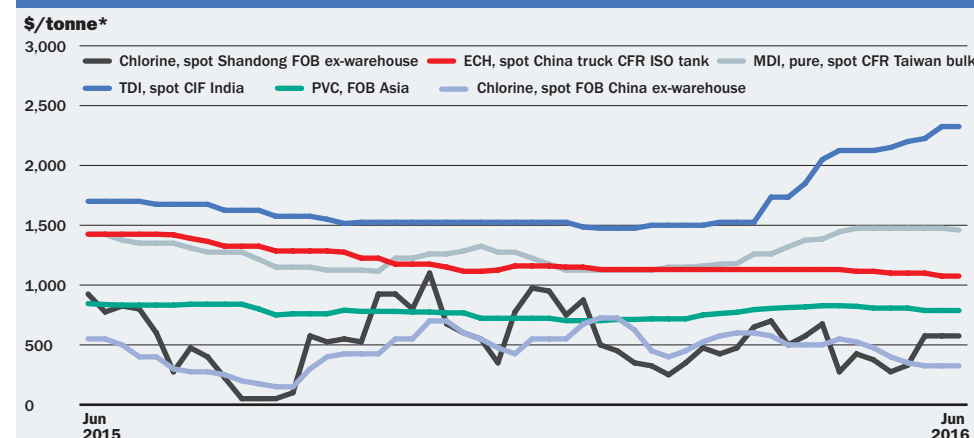
CHLORINE VALUE CHAIN - US



-7.6%

Year-on-year decline in US MDI prices from almost \$3,500/tonne

CHLORINE VALUE CHAIN - ASIA

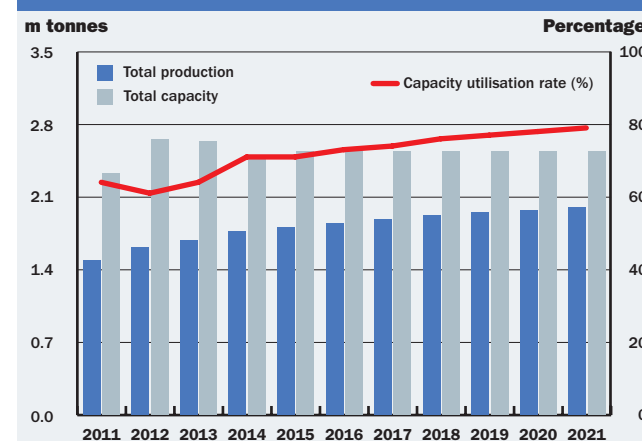


+58%

Surge in India TDI prices from their 52-week low of \$1,475/tonne

CHLORINE VALUE CHAIN – SUPPLY AND DEMAND OUTLOOK

SUPPLY AND DEMAND OUTLOOK - EPICHLOROHYDRIN

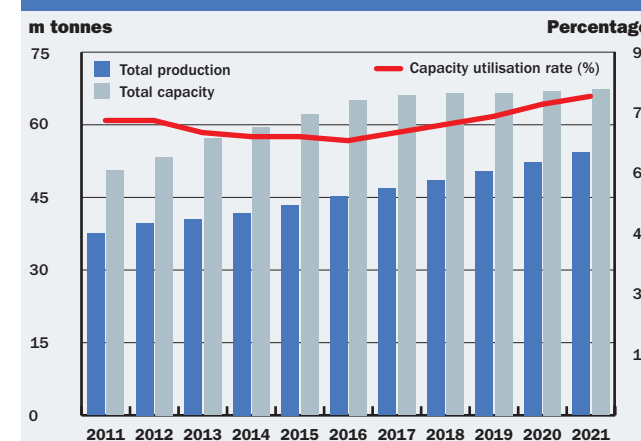


10.5%

Anticipated gain in production through 2021 from 2015 levels

- A steady improvement in operating rates is expected through 2021 to 79%
- Capacity is expected to be flat through the period while production edges higher

SUPPLY & DEMAND OUTLOOK - PVC

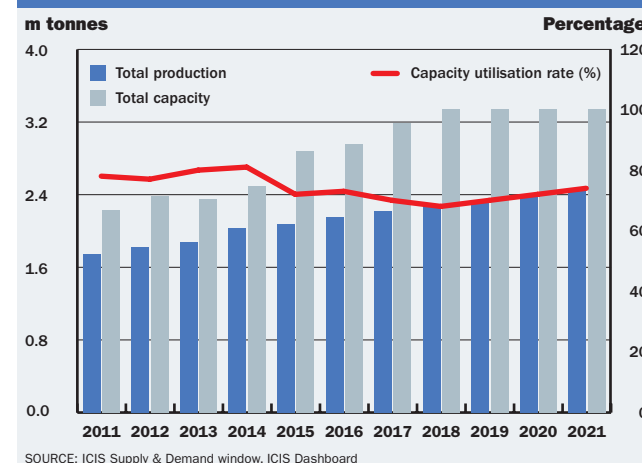


8.3%

Projected capacity increase from 2015 to 2021

- Operating rates are expected to tighten considerably to 79% by 2021
- Production in 2016 should rise by 4.0% to over 45m tonnes

SUPPLY AND DEMAND OUTLOOK - TDI

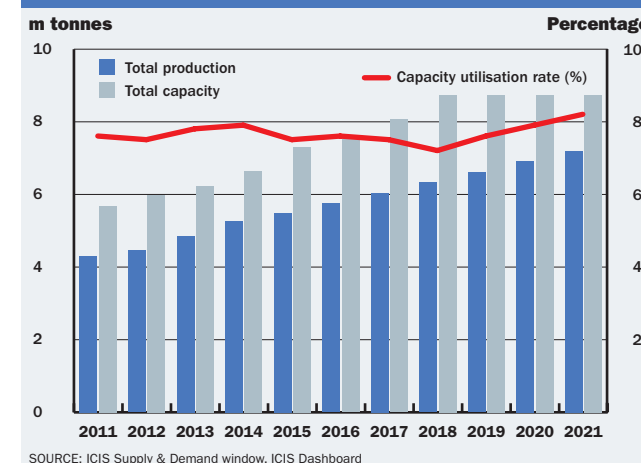


16%

Expected capacity increase by 2018 versus 2015 levels

- Not much improvement is expected in TDI operating rates through 2021 as a result of a major capacity surge in 2018
- Production is expected to rise by 3.3% in 2016 to 2.15m tonnes

SUPPLY AND DEMAND OUTLOOK - MDI



76%

Expected operating rate in 2016, about the same as in 2011

- A long-term increase in operating rates is expected by 2021
- Overall capacity is expected to jump by over 8% in 2018, after which it should remain flat for several years

ICIS SUPPLY AND DEMAND DATABASE

The ICIS Supply and Demand database provides a comprehensive picture of global supply and demand for the full spectrum of products from oil to chemical intermediates. Its range of product selection options help explain historical price movements, changes in company ownership and illustrates changing supply patterns in the future. It allows you to refine, sort, slice and export data, or create graphs and charts to illustrate your findings more easily and support your strategic planning. For more information or to request more information, please visit www.icis.com/supplydemand