

GLOBAL VINYL MARKETS

Lack of investments in new PVC capacity likely to push up operating rates

The global polyvinyl chloride (PVC) industry is diverging into two distinct segments, based on manufacturing technology: ethylene based and carbide based PVC. Dominant in the latter is China, with 45% of global capacity, 85% of which is based on the carbide process.

Thanks to the emergence and continued growth of the carbide based process, the business of PVC today is far less reliant on ethylene availability and economics, as compared to the past where much of the capacity was based on the oxychlorination of ethylene.

Margins under pressure

In the international markets, PVC prices have moved in a narrow band over the last 4-5 years, and margins have been under pressure. According to Mr. Stephen Harriman, Consultant, the economics of making PVC without ethylene integration is now suspect. "VCM to PVC in South East Asia is making no

money," he said, while speaking at the 4th International PVC and Chlor-Alkali Conference, Vinyl India 2014, in Mumbai from May 8-9, 2014.

While the availability of cheap gas, salt and competitive ethylene prices *prima facie* makes for a congenial scenario for investments to flow into the vinyl business in the US, the decision to invest is a difficult one, according to Mr. Harriman, despite plants currently operating at their maximum capacity. As per the current outlook, only one expansion is expected in the US in the near term – Shintech's 300-ktpa project – although Mexichem's 150-ktpa expansion may come to fruition in the longer term. "As the US economy revives, it is difficult to believe that US will contribute to PVC exports at its current levels," he added, given the boost to domestic consumption expected with a recovery in the economy and on construction spending.

According to Mr. Michael Smith, Vice-President, EMEA, IHS Chemicals, shale gas has not just rocked the boat, but turned it upside down. Up to 2020, gas prices in the US are expected to trade at a significant discount to oil (on an energy equivalent basis). This will drive the nearly 10-mtpa additional ethylene capacity that will come up in the US. But the US will not be the sole player in the investment binge. As much as 19-mtpa of olefin capacity based on methanol is likely in China to feed domestic markets.

Margins for PVC producers in North America have ranged from \$200-300 per tonne, even as producers in Asia and Europe are making close to nothing. "North America has a tremendous advantage from the ethylene side and also from the electricity standpoint; electricity prices are half that of Europe and this greatly benefits the chlorine side," he noted. With few PVC producers in Europe and North East Asia integrated to ethylene, they have little option but to buy at market prices.

Table 1
Major chlor-vinyl projects

Region	Company	Chloralkali	EDC	VCM	PVC
North America	Dow/Mitsui		600		
	Shintech	200		300	300
Latin America	Pemex			180	
	Mexichem				150*
Europe	Kaustik			400	400
	RusVinyl	230		300	300
Middle East	Saltic	330	400		
Africa	TCI Sanmar				200
Asia	Asahimas	180		400	250
	Hanwha	200	200		
China (5)		1766		1540	1540

Source: Stephen Harriman

Europe – facing chlorine crunch

In Europe, the PVC industry is saddled with erratic operating rates, high costs of ethylene, and poor demand for caustic soda to support chlorine markets. By December 2017, all of the remaining mercury cell based caustic soda/chlorine plants – totalling to about 30% of the total installed capacity – will need to convert to membrane based production, as per voluntary commitments given to the European agencies, or shut down.

Considering the costs of conversion are about €400 per electrochemical unit

Table 2
Global supply-demand balance for caustic soda

[Million tonnes]

	2008			2012			2016		
	Capacity	Demand	Balance	Capacity	Demand	Balance	Capacity	Demand	Balance
China	23.2	17.1	6.1	37.9	24.1	13.8	41.4	28.5	12.9
NE Asia (excl. China)	8.4	5.5	2.9	8.3	5.6	2.7	8.7	6.0	2.7
N. America	14.6	12.0	2.6	15.6	11.9	3.7	17.0	12.5	4.5
Middle East	1.9	1.1	0.8	2.8	1.2	1.6	3.1	1.6	1.5
W. Europe	11.6	9.6	2.0	11.3	9.0	2.3	10.8	9.3	1.5
Latin America	2.4	4.0	-1.6	2.5	4.1	-1.6	2.6	4.6	-2.0
Others	9.9	9.4	0.5	10.3	10.7	-0.4	10.8	13.0	-2.2
Total	72.0	58.7	13.3	88.7	66.6	22.1	94.4	75.5	18.9

Source: Issey Honjo

(ECU), many producers may be forced to take the drastic step of closing ethylene dichloride (EDC) production. "It is clear that Europe will lose capacity for chlorine; PVC producers will then have no option but to bring in EDC from outside the region," Mr. Harriman added. Mr. Issey Honjo, General Manager, Chlor-alkali Division, Mitsui & Co. Ltd., estimated that 2.9-mtpa (on dry weight basis) of caustic soda capacity in Europe is based on mercury cells and will need replacement. He estimated the capital cost of investment in a new plant at about \$1000 per ECU, and agreed that conversions would be challenging.

Shrinking merchant markets for EDC/VCM

While 1.5-mt of vinyl chloride

monomer (VCM) was traded in the international markets in the late 1990s for a much smaller PVC industry, the volumes have since shrunk and exposure to this market poses vulnerabilities for non-integrated PVC producers.

Likewise, EDC plants are unlikely to be built in the future with an eye on merchant markets. "The supply-demand balance for EDC indicates tightness, but this can change very quickly as only 10% of the EDC produced is traded. PVC producers who depend on EDC imports will need to be careful as not many producers of EDC will invest for the merchant market," Mr. Honjo warned.

Global PVC demand to grow at 5% per annum

On the demand side, things seem

to be improving, although concerns remain. Nearly 70% of PVC is consumed in the construction industry (the figure is even higher for India). Global demand is currently estimated at about 38.5-mt – significantly below a nameplate capacity of 55-mtpa – and is expected to grow at about 5% per annum (compared to 7% per annum in India), faster than capacity growth. This is expected to lead to an improvement in operating rates across major regions, although in China the figure is expected to reach only about 60% by 2018 (compared to 50% now). "The tide of excess capacity seems to be peaking, and will decline from about 20-mt now. After 2016, no new PVC capacity will come up in China," noted Mr. Smith. "Western Europe could become a big importer of EDC as local chlorine capacity shuts down."

OVER-HEATED MARKET

China's investment binge on carbide-based PVC likely to slow down

China's PVC production continues to rise "at an alarming rate" and in 2013 output reached 14.959-mt – a 9% increase over the previous year. But Mr. Harriman noted, this is unsustainable, especially as the government is now

keen to slow the pace of investments into sectors deemed to have significant over-capacity. "China is the world's most important dustbin for imports, but is also a significant exporter. With imports declining, it is likely that China

will become a net exporter of PVC in the next 18-24 months," he added.

China's PVC market represents several contradictions. While there is over-investment in carbide based PVC in the

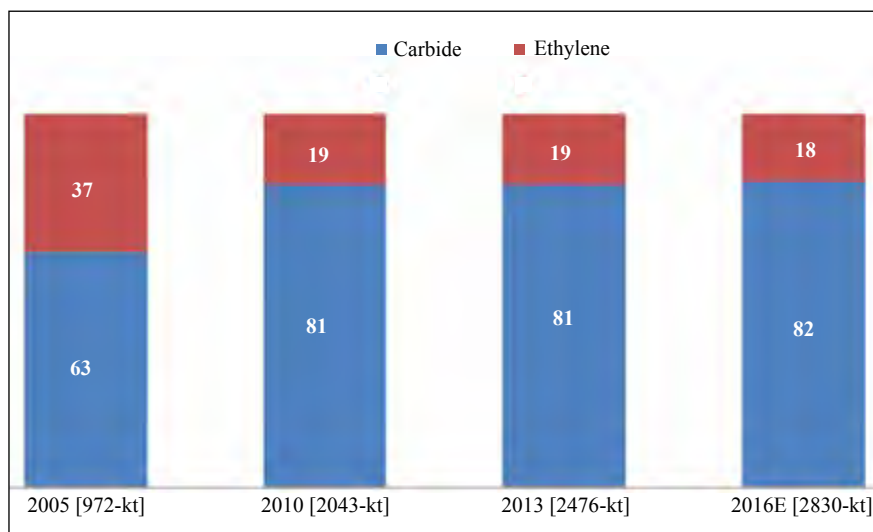


Fig. 1: Share of calcium carbide in China's PVC capacity

country – with about 5-mtpa of additional capacity planned – there is under-investment in ethylene-based capacity for obvious reasons of poor feedstock availability. Most new projects are located in the western parts of the country, where the important raw materials

– coal, limestone and salt – are available in plenty. With little or no markets for the caustic soda produced in these integrated units, producers are left with no option but to solidify the alkali and ship it across the country to markets in the eastern and southern parts.

Table 3
Calcium carbide route to PVC

Advantages	Disadvantages
Less volatile price of raw material: coal vs. oil	Higher energy and water consumption
Cheaper investment and production costs than ethylene route	Higher emissions: CO ₂ , dust, carbide sludge, Hg catalysts
	PVC 'contaminated' with HgCl ₂ catalyst residues

Source: Stephen Harriman

Table 4
Chinese PVC projects

Region	Process	2014	2015	2016	2017	Total
East China	Ethylene	1,150			400	1,550
	Acetylene	650				650
Total East China		1,800			400	2,200
North China	Ethylene	630				630
	Acetylene	400	300		300	1,000
Total North China		1,030	300		300	1,630
Northwest China	Acetylene	2,040	500			2,540
Total China		4,870	800		700	6,370

Source: Stephen Harriman

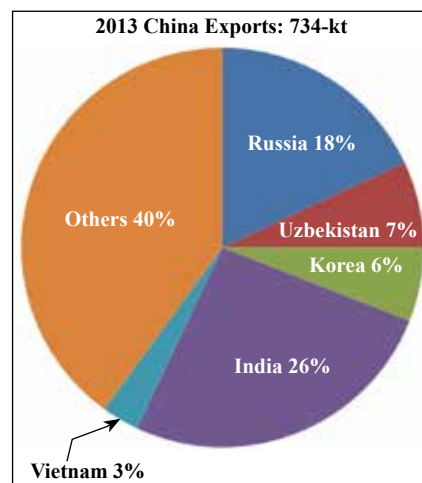


Fig. 2: Exports of PVC from China by country (2013)

India – an important market for Chinese PVC producers

Mr. Yingmin Ye, Partner, CHEMI Consulting, observed that India is an important market for Chinese PVC exports, but the imposition of an anti-dumping duty ranging from \$44-148 per tonne by India, has served to curtail exports. The main ports from which exports of PVC take place are Tianjin (close to Inner Mongolia), Shanghai and Urumqi (which is strategically located to serve markets in Russia and Kazakhstan). “The export price to India is higher than to other destinations due to higher supply chain costs as it is a log haul from Urumqi to Tianjin.”

Chinese taxation policies, he added, have also contributed in no small measure to drive exports. For example, between 2008 and 2013 the tax refund on exports went up from 5% to 13%, and so did exports. “This is unlikely to increase any further,” Mr. Ye noted.

According to him the cash costs of PVC production (carbide route) was about \$900 per tonne, and with tax refund the costs come down to \$861 per tonne. This compares with an export price (FOB basis) of \$976 per tonne, implying a margin of about \$115 per tonne for Chinese producers.

DOMESTIC MARKETS

Imports to play greater role in Indian PVC markets

Imports will play an important role in meeting Indian PVC demand in the near future, as domestic supply will not keep pace with demand. In 2013-14 – a year when Indian PVC demand grew only 2% to 2.3-mt – imports of PVC resin to India in 2013-14 were expected to reach 1.026-mt. Leading exporters of PVC resin to India in 2013-14 were

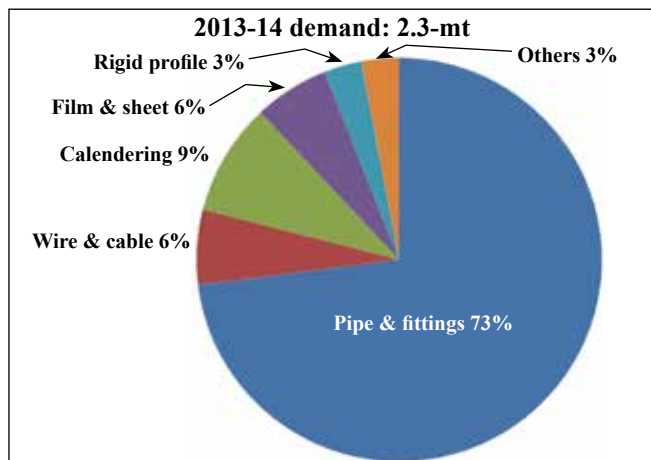


Fig. 3: Indian demand for PVC by application

Source: Reliance Industries Ltd.

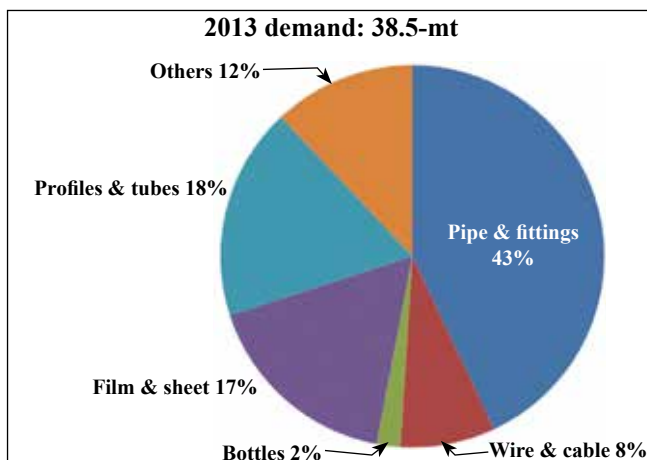


Fig. 4: Global demand for PVC by application

Source: IHS Chemicals

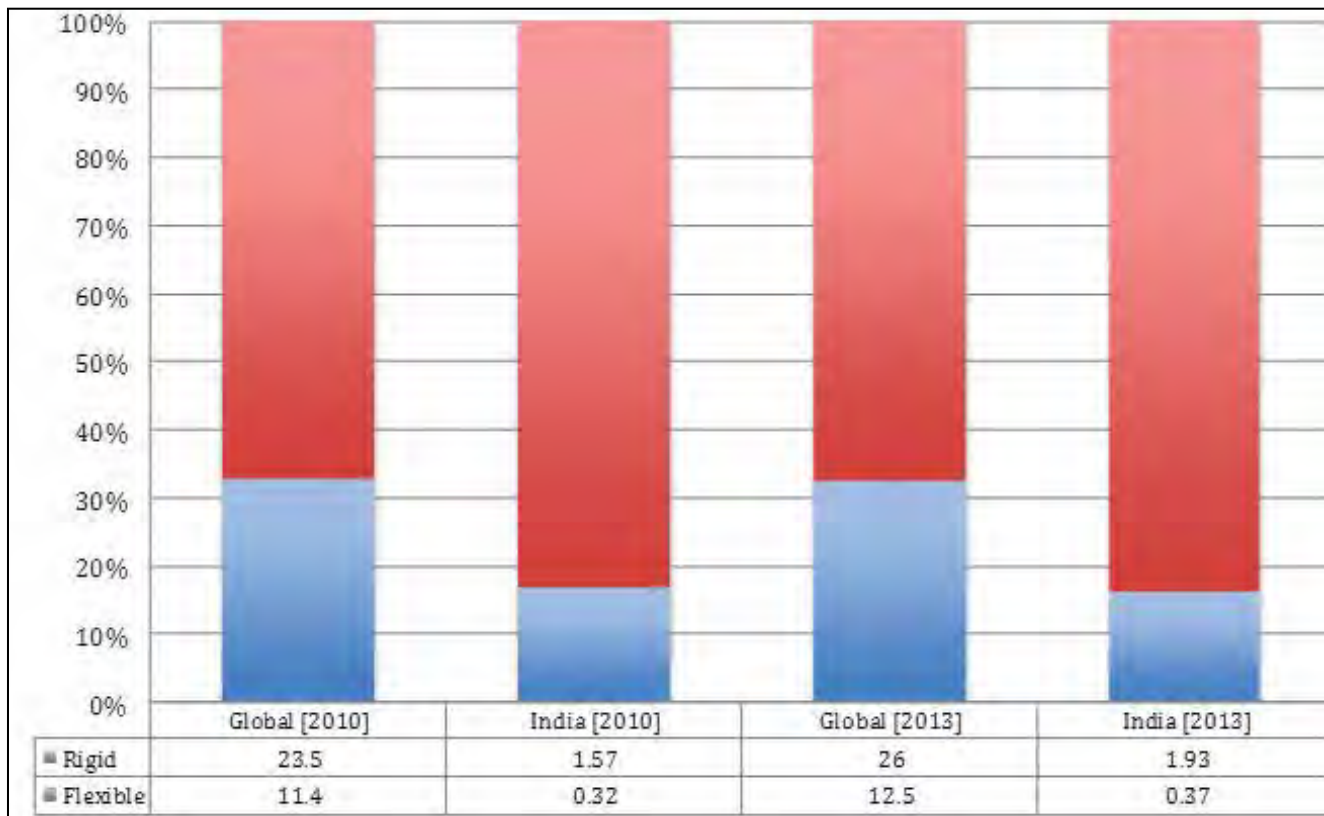


Fig. 5: Flexible vs rigid applications of PVC: India vs RoW

Source: Reliance Industries Ltd.

Taiwan (318-kt), Korea (299-kt) and China (112-kt). “Being a major importer – now higher than China’s – India is becoming a focus market for exporters all over the world,” observed Mr. Shivprasad Nailk – Sr. Vice-President, Reliance Industries Ltd.

The only increment to domestic production in the near future will come from a 100-ktpa expansion being implemented by Reliance Industries Ltd., likely to be commissioned in May 2014. Capacity additions are not happening, according to him, due to high feedstock costs, scarce raw materials, high energy costs and low return on investment on account of dumping at marginal costs.

Pipes & fittings account for nearly 73% of the domestic demand for PVC. “Only post-2015 will we see demand for applications like profiles pick up. A lot of groundwork has been done and a few producers are adding extruders. Some European profile suppliers are also looking at creating local manufacturing capacity,” Mr. Naik added.

The government’s focus on infrastructure development and low per capita consumption will remain important drivers of growth.

Caustic soda imports set to grow

Mr. Dan Green, Product Manager – Chlor-alkali, Tricon Energy, noted that India was a base market for caustic soda exported by Saudi Arabia, but that has changed with the imposition of trade barriers by India. “If this changes, Vizag alumina can be very easily serviced by imports,” he noted.

In his view, the Indian deficit in caustic soda – currently estimated at about 300-kt on dry weight basis – will continue to grow with rising demand from the alumina industry.

RECOGNITION

Lifetime Achievement Awards presented to Dr. Michael Rosenthal and Mr. Ajay Shriram

On the first day of the conference, the organizers presented the ‘Life Time Achievement Awards’ to two great personalities who have shaped vinyl industry in India as well as globally:

- Mr. Ajay S Shriram, Chairman & Sr. Managing Director, DCM Shriram Consolidated Ltd. (DSCL), who started PVC production in India in 1963; and
- Dr. Michael Rosenthal, Chairman, Advisory Board, Baerlocher, a leading producer of PVC stabilizers headquartered in Germany, but with a global footprint in major markets, including in India.



Dr. Michael Rosenthal, Chairman, Advisory Board, Baerlocher, receiving the Lifetime Achievement Award from Mr. Nikhil Meswani, Executive Director, Reliance Industries Ltd.



Mr. Ajay S. Shriram, Chairman & Sr. Managing Director, DSCL, receiving the Lifetime Achievement Award from Mr. Kamal Nanavaty, President – Strategy Development, Reliance Industries Ltd.

STABILISERS

Lead is dead.... At least in the developed world, if not India

Unlike PVC, the business of additives is not a global one, and has its own set of growth drivers. One of which is the megatrend of sustainability. According to Mr. Arne Schulle, Chief Executive Officer, Baerlocher Group of Companies, while PVC has become a more sustainable raw material, it still has some way to go. In Europe, for instance, nearly 365-kt of the polymer is recycled.

The global demand for stabilisers for PVC – estimated at about 1-mt – shows several regional and national characteristics, determined, amongst other factors, by the applications the polymer is put to, as well as national and international legislations. In Europe and Russia, for instance, the profiles market is bigger than in other regions, and has converted to calcium (Ca) based stabilisers. With the European vinyl industry voluntarily committed to phasing out lead by end-2015, “lead is dead,” Mr. Schulle noted – a remarkable change considering that lead-based stabilisers accounted for 72% of the European market at the turn of the century. One of the reasons for the swift switch-over to safer stabilisers like the

calcium-based systems is that cost-effective solutions with less lead content are on hand.

In China, where lead still dominates, a clear trend to calcium-based systems is already being seen in segments such as wire & cable, pipes and profiles. “When legislation comes the changeover will be very rapid,” added Mr. Schulle.

In North America, while tin-based systems dominate, the cable market has shown a keen interest in calcium-based systems.

In India too lead dominates, but the first conversions in cables and selectively in pipes & profiles is already taking place.

Clearly, the trend to embracing more environmentally friendly options to lead is emerging and accelerating – even outside Europe.

Cost of stabilisation vs stabiliser costs

According to Mr. Rajeev Mehendale, Director, Kalpataru Organics Pvt. Ltd., it is important to consider the cost of stabilisation and not merely the cost of stabilisers, when selecting a suitable

Table 5
Global demand for PVC stabilisers

Region	Demand [Kilotonnes]	Growth rate [%]
North America	120	3
South America	50	3
Europe	210	W. Europe 0-1; Central & Eastern Europe 4
China	420	5-8
Africa & Middle East	70	5
India	60	7
Asia-Pacific	100	4
Total	1030	

Source: Arne Schulle

PVC: Lowest carbon footprint amongst thermo-plastics

PVC has the smallest carbon footprint of all plastics, thanks to its high chlorine content, and is 100% recyclable. Again thanks to its high chlorine content, PVC is inherent flame-retardant, favouring its use for wire & cable.

According to Mr. Kevin Skrada, General Manager International, Axiall Corporation LLC, from a performance perspective PVC occupies a unique position – above polyolefins and below high-performance engineering plastics. It can replace polycarbonate, ABS and their blends, and also wood-metal composites, especially for applications at temperatures below 100°C.

Table 6
Carbon footprint of thermoplastics

Thermoplastic	Carbon content, %
Polyethylene	86
Polypropylene	86
Polystyrene	92
Rigid PVC	38

system for use. Even though the stabilizer forms just a small part of the total purchases of a PVC processor, it has a disproportionate bearing on the costs, quality and hence the profitability of the organization.

“Indirect cost advantages, such as reduced power costs, labour costs and cost of reworking & rejections, can be substantially reduced with the selection of the right stabilisation system,”