

The Impact of Electricity Rationing on Phosphorus Chemicals and Market Outlook in China

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Executive summary

Since September, due to the tight electricity supply and the sharp increase in the price of raw materials such as coal, many provinces in China have adopted electricity rationing measures. The phosphorous chemical industry has been severely impacted, and the output and operating rate of enterprises dropped significantly; prices of many phosphorous chemicals saw rapid increases in September and October.

The electricity rationing measures have a serious impact on the production of yellow phosphorus, an energy-intensive chemical product. The operating rate of yellow phosphorus industry slipped to a low level in September; the price of yellow phosphorus saw a sharp increase. It was difficult to ease the tight supply in the market in the short term. As of October this year, the output of yellow phosphorus was about 550,000 tonnes in China.

Affected by the shortage of yellow phosphorus and the price surge, as well as electricity rationing in the main production bases of its downstream products, some enterprises went through production reduction or even shutdown. Outputs of phosphoric acid, phosphorus trichloride and phosphorus oxychloride decreased, causing tight market supply and price rise.

The electricity supply crunch in China has been effectively alleviated with the recent efforts of all parties to ramp up the coal supply. The price of coal gradually declines, and enterprises gradually resume production. It is expected that in the next three months, the price of phosphoric acid, phosphorus trichloride and phosphorus oxychloride will fall, while prices of yellow phosphorus and phosphate fertilisers are still at a high level with limited room to decrease.

Methodology

The report is drafted by diverse methods as follows:

1) Desk research

The sources of desk research are various, including published magazines, journals, government statistics, industrial statistics, Customs statistics, association seminars as well as information from the Internet. A lot of work has gone into compilation and analysis of the obtained information. When necessary, checks were made with Chinese phosphorus chemicals suppliers regarding market information such as key producers, production level, key end-users, end user demand and so on.

2) Telephone interview

CCM has carried out extensive telephone interviews in order to grasp the actual market situation of phosphorus chemicals in China.

Interviewees cover:

- Producers
- End users
- Traders
- Associations

3) Network search

CCM employs a network to contact industry participants by using B2B websites and software. CCM also obtains registration information via the network.

4) Data processing and presentation

The data collected and compiled were sourced from:

- CCM's own database
- Published articles from periodicals, magazines and journals
- Statistics from governments and international institutes
- Telephone interviews with domestic suppliers, end users, government, industrial experts
- Third-party data providers
- Information from the Internet

The data from various sources have been combined and cross-checked to make this report as precise and scientific as possible. Throughout the process, a series of internal discussions were made in order to analyse the data and have conclusions drawn.

Table Exchange rate USD/CNY, Jan.–Nov. 2021

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
2021	6.5408	6.4623	6.4754	6.5584	6.4895	6.3572	6.4709	6.4660	6.4680	6.4604	6.4192	-	6.4660

Source: The People's Bank of China

1 Background

Under tightened electricity supply, many provinces in China have adopted electricity rationing measures to restrict industrial production since September this year. According to incomplete statistics, at least 15 provinces have rolled out such measures. Many producers and industrial chains have been affected.

According to the National Energy Administration of China, during Jan.–Sept. 2021, total domestic electricity consumption was 6,165.1 billion kWh, a year-on-year increase of 12.9%, and the total electricity supply was 5,417.7 billion kWh, a year-on-year increase of 13.5%. However, since Sept., the relation between supply and demand of electricity has become strained. The imbalanced relation in some provinces prompted local governments to implement electricity rationing measures.

- China's electricity demand has grown rapidly so far this year, and some provinces have seen peaks in electricity consumption.
- Electricity supply has been tight. On the one hand, limited by the transmission capacity of existing power grid, electricity cannot be timely deployed to provinces lacking electricity. On the other hand, shortage of coal and its soaring price have forced thermal power companies to cut down power generation. Worse off, lower-than-normal water in main river basins has affected hydropower.

Electricity rationing and production restriction in some provinces also has relevance to the Dual Control policy on energy consumption & energy intensity. In H1 2021, energy consumption in nine provinces/autonomous regions—Qinghai, Ningxia, Guangxi, Guangdong, Fujian, Xinjiang, Yunnan, Shaanxi and Jiangsu—did not fall but rise instead, and they were given first-level warning by National Development and Reform Commission (NDRC). Some of these provinces have adopted effective measures to bring down energy consumption intensity.

Yunnan, Guizhou and Sichuan provinces are main production bases of yellow phosphorus and phosphate fertiliser. Jiangsu and Shandong provinces are main production bases of phosphorus trichloride and phosphorus oxychloride. Production of phosphorus chemicals has been affected with introduction of electricity rationing measures like production suspension/reduction, staggered production, time-phased electricity rationing and cut to preferential electricity charge.

Table 1-1 Electricity rationing measures in major provinces producing phosphorus chemicals

Province	Affected product	Measure	Main reason
Yunnan	Yellow phosphorus, phosphate fertiliser	From September to December 2021, the average monthly output of yellow phosphorus shall not exceed 10% of the output in August this year.	Dual Control policy on energy consumption & energy intensity
Guizhou	Yellow phosphorus, phosphate fertiliser	Based on the scale of electricity shortage in the province, a 4-level early warning system is adopted. Each level means a number of enterprises in the orderly power consumption responding company list shall be reasonably arranged for peak-shift production and peak-avoidance production according to the actual situation. (Note: 9 yellow phosphorus enterprises are included in the list.)	Tight electricity supply
Sichuan	Yellow phosphorus, phosphate fertiliser	Industrial enterprises should use electricity efficiently, reasonably arrange production (work hour shift and peak-shift production), and actively adopt energy-saving equipment that meets national energy consumption standards to help alleviate power supply pressure during peak hours. They should avoid idle equipment running, orderly use high energy-consuming equipment, and standardize the use of air-conditioning, lighting and other electrical equipment and facilities, so as to save electricity from non-production and non-essential uses.	Tight electricity supply

Province	Affected product	Measure	Main reason
Shandong	Phosphorus trichloride, phosphorus oxychloride	Follow the principle of giving priority to demand response and guaranteeing orderly electricity consumption. Some enterprises have undergone electricity rationing and production restriction.	Tight electricity supply
Jiangsu	Phosphorus trichloride, phosphorus oxychloride	Restrict production by different level. Some enterprises have undergone a work mode of two-day normal production plus two-day restricted production.	Dual Control policy on energy consumption & energy intensity

Source: CCM

2 The impact on the phosphorus chemicals

2.1 Yellow phosphorus

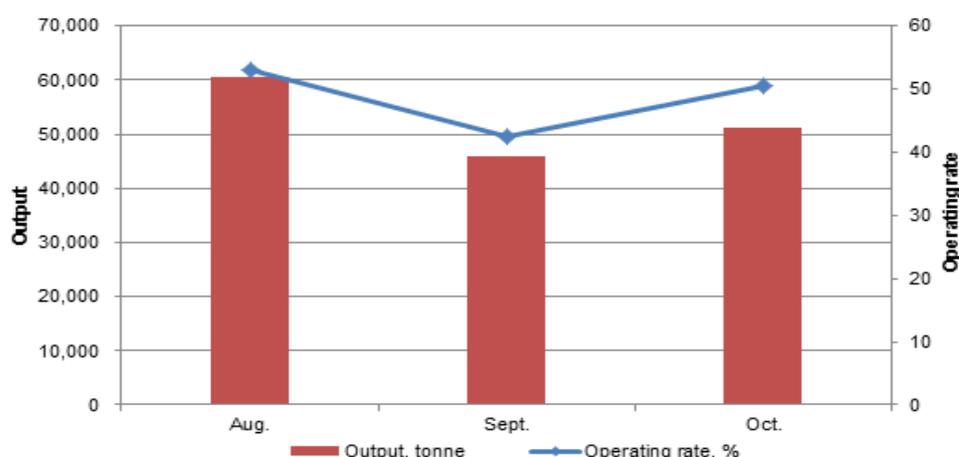
2.1.1 Production situation

According to CCM investigation, China's yellow phosphorus capacity was 1,259,000 t/a in 2020, and the capacity is mainly concentrated in the Yunnan, Guizhou and Sichuan provinces, accounting for 42%, 21% and 14% of the national total respectively. It is reported that production of yellow phosphorus consumes a large amount of electricity: about 14,000 kWh is consumed to produce 1 tonne of yellow phosphorus. Therefore, electricity rationing has a great impact on yellow phosphorus production.

In Jan.–Oct. 2021, the output of yellow phosphorus in China was about 550,000 tonnes. With large-scale electricity rationing implemented, operating rate of yellow phosphorus enterprises declined, and the monthly output of yellow phosphorus was registered 46,000 tonnes in Sept. and 51,200 tonnes in Oct., down quite a lot from 60,600 tonnes in Aug. Specifically:

- Yunnan Province: Yellow phosphorus production here mainly relies on hydropower. However, drought and lack of water this year have led to insufficient hydropower generated. In addition, local coal stock for thermal power plants has shrunk continuously. Therefore, electricity supply in the province has been in severe shortage. From Sept., operating rate of local yellow phosphorus enterprises dropped significantly, and the supply plummeted. With local government releasing the *Notice on Resolutely Doing a Good Job in Dual Control of Energy Consumption* on 11 Sept., yellow phosphorus production is strictly controlled as the average monthly output in Sept. to Dec. is forced below 10% of the output in Aug. (23,800 tonnes). Thus, yellow phosphorus production came to a halt by the end of Sept. in general. The production gradually resumed in Oct., and the supply in the market has increased a lot. However, bounded by the electricity rationing measures, yellow phosphorous enterprises in the province will not see a big jump in operating rate.
- Guizhou Province: The operating rate of yellow phosphorus enterprises slipped to a low level in Sept., caused by electricity rationing there, but at the end of the month, the operating rate jumped to 70% with eased situation. Its output of yellow phosphorus was about 7,100 tonnes in Sept., a decrease of some 31% month on month. These enterprises maintained production during the National Day holiday. Yet most of them came to production suspension in mid-Oct. when a sudden electricity rationing took place; some did not resume normal production until the end of Oct.
- Sichuan Province: The electricity rationing here has been relatively weak, which has little impact on yellow phosphorus production. In Aug.–Oct., operating rate of local yellow phosphorus enterprises was stable, and the monthly output fluctuated around 15,000 tonnes.

Figure 2.1.1-1 Monthly output and operating rate of yellow phosphorus in China, Aug.–Oct. 2021



Source: CCM

Overall, electricity rationing in Yunnan Province is the strictest; many companies there stopped or reduced production. By Oct., the output of yellow phosphorus in Yunnan totalled less than 250,000 tonnes this year, and the market supply was tight. It is understood that during Sept. to Oct., most producers in Yunnan reported staggered production—working at night to produce normally or at lower load.

Table 2.1.1-1 Production of major producers of yellow phosphorus in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Jiangsu Chengxing Phosph-Chemical Co., Ltd.	Jiangsu, Yunnan, Guangxi	180,000	56,000	Suspension in all its production bases
2	Hubei Xingfa Chemicals Group Co., Ltd.	Hubei	162,500	103,833	Barely affected
3	Yunnan Phosphorus Group Co., Ltd.	Yunnan	120,000	18,000	Suspension
4	Chengdu Winttrue Holding Co., Ltd.	Sichuan	60,000	27,500	Barely affected
5	Yunnan Jianglin Group Co., Ltd.	Yunnan	37,400	17,100	Suspension
6	Yunnan Yuntianhua Co., Ltd.	Yunnan	30,000	18,000	Production restriction

Source: CCM

2.1.2 Price analysis

The ex-works price of yellow phosphorus in China leaped from USD3,744/t in Aug. to USD7,625/t in Oct., pushed by supply contraction under electricity rationing.

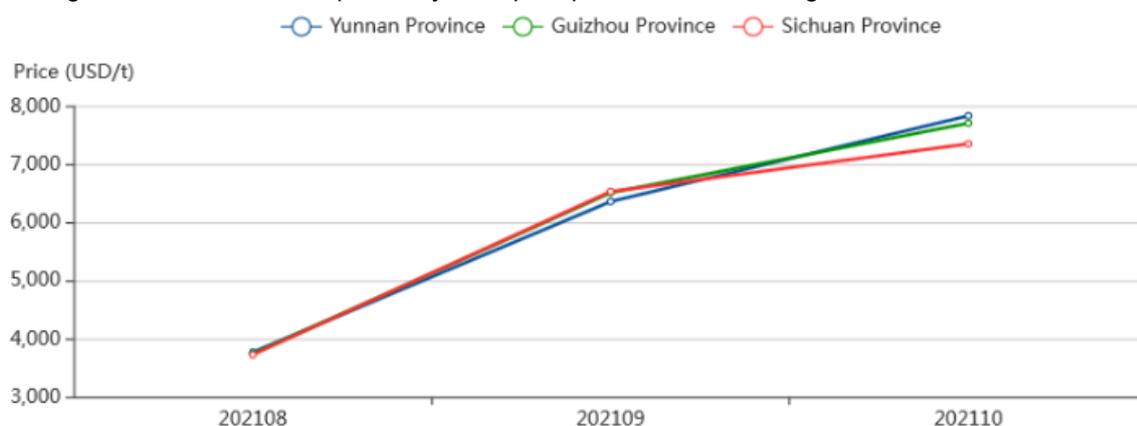
In Sept., downstream companies made active purchase on hearing electricity rationing in Yunnan. As the supply of yellow phosphorus tightened, the price rose sharply. The price in Yunnan hit USD6,354/t, an increase of 69% month on month. Similarly, the prices in Guizhou and Sichuan jumped by 74% and 75% to USD6,506/t and USD6,527/t respectively.

In Oct., the price continued to rise. The main driving force is the drastically-reduced output in Guizhou, owing to the large-scale electricity rationing in the province. At same time, the situation in Yunnan was still bad, though recovered. Thus the supply of yellow phosphorus further contracted. Besides, yellow phosphorus enterprises in Yunnan and Guizhou raised

their prices; monthly average in the two regions increased by 23% and 18% month on month respectively. But the price did not rocket like that in Sept., mainly because:

- First, the sharp rise in Sept. spread a wait-and-see sentiment among downstream enterprises. It put certain pressure on yellow phosphorus producers.
- Second, demand weakened this month as downstream producers mainly consumed inventory. There was not a large gap between demand and supply in the market.

Figure 2.1.2-1 Ex-works price of yellow phosphorus in China, Aug.–Oct. 2021



Source: CCM

Rising production cost also contributed to the price increase. Prices of the raw materials such as phosphate ore and coal have been on the rise as well.

At present, the cost of yellow phosphorus production in Yunnan and Sichuan provinces is relatively high, while that is lower in Guizhou Province. Facing higher cost, the yellow phosphorus enterprises in Sichuan maintained a rather stable operation.

Table 2.1.2-1 Estimated raw material and energy costs of yellow phosphorus production

Raw material	Phosphate rock (t)	Coke/anthracite (t)	Silica (t)	Graphite electrode (t)	Electricity (kWh)	Total (USD/t)
Unit consumption (/t)	10.00	1.90	3.00	0.02	14,000.00	
Province	Price (USD/t)					
Yunnan	80.40	567.41	0.00	3,092.15	0.06	2,836.24
Guizhou	85.03	262.83	29.38	3,092.15	0.08	2,650.52
Sichuan	61.84	567.41	29.38	3,092.15	0.08	2,972.42

Note: 1. It is calculated on Sept. price. 2. Anthracite is used in Guizhou Province.

Source: CCM

Table 2.1.2-2 Proportion of costs of yellow phosphorus in China in September 2021

Province	Share, %				
	Phosphate rock	Coke/anthracite	Silica	Graphite electrode	Electricity
Yunnan	28%	38%	0%	2%	32%
Guizhou	32%	19%	3%	2%	44%
Sichuan	21%	36%	3%	2%	38%

Source: CCM

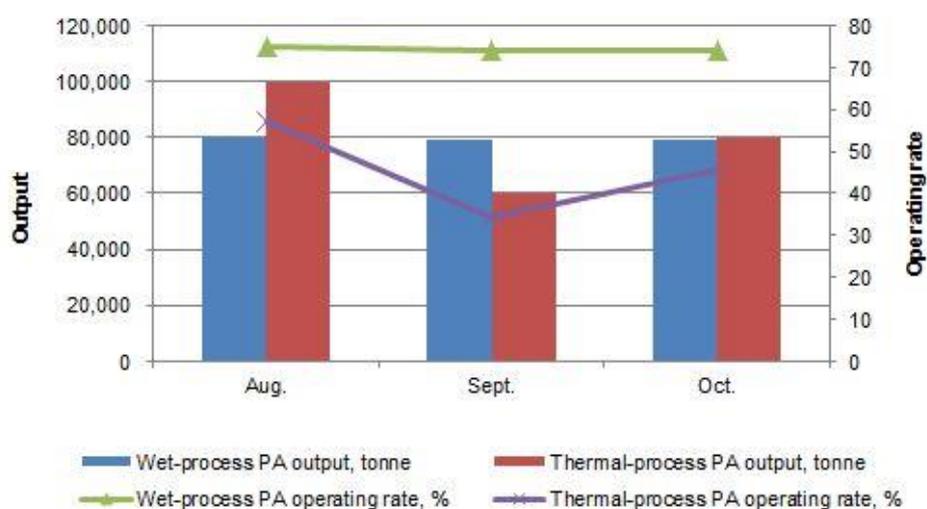
2.2 Phosphoric acid

2.2.1 Production situation

In 2020, the capacity of thermal-process PA was around 2,000,000 t/a with a relatively low operating rate, while the capacity of wet-process PA (refers to purified wet-process PA, the same below) was more than 1,200,000 t/a with a high operating rate. The ratio of thermal-process PA output to wet-process PA output in China was near 6 to 4, heading towards 5 to 5.

In China, thermal-process PA capacity is distributed in many places, such as Yunnan, Guizhou, Sichuan, Hubei, Jiangsu and Guangxi, while wet-process one is distributed in fewer places. Thermal-process PA has bigger fluctuations in production and supply under electricity rationing, for it consumes yellow phosphorus as a raw material.

Figure 2.2.1-1 Monthly output and operating rate of thermal-process PA & wet-process PA in China, Aug.–Oct. 2021



Source: CCM

Table 2.2.1-1 Production of major PA producers in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Wengfu (Group) Co., Ltd.	Guizhou, Sichuan, Gansu, Fujian	1,000,000	830,000	Barely affected
2	Jiangsu Chengxing Phosph-Chemical Co., Ltd.	Jiangsu, Guangxi, Yunnan	720,000	210,000	Suspension in all its production bases
3	Hubei Xingfa Chemicals Group Co., Ltd.	Hubei	300,000	200,000	Barely affected
4	Guangxi Mingli Chemicals Co., Ltd.	Guangxi	300,000	170,000	Production restriction
5	Yunnan Phosphorus Group Co., Ltd.	Jiangsu, Guangxi, Yunnan	300,000	150,000	Suspension in Jiangsu base and production restriction in Yunnan and Guangxi bases

Source: CCM

2.2.2 Price analysis

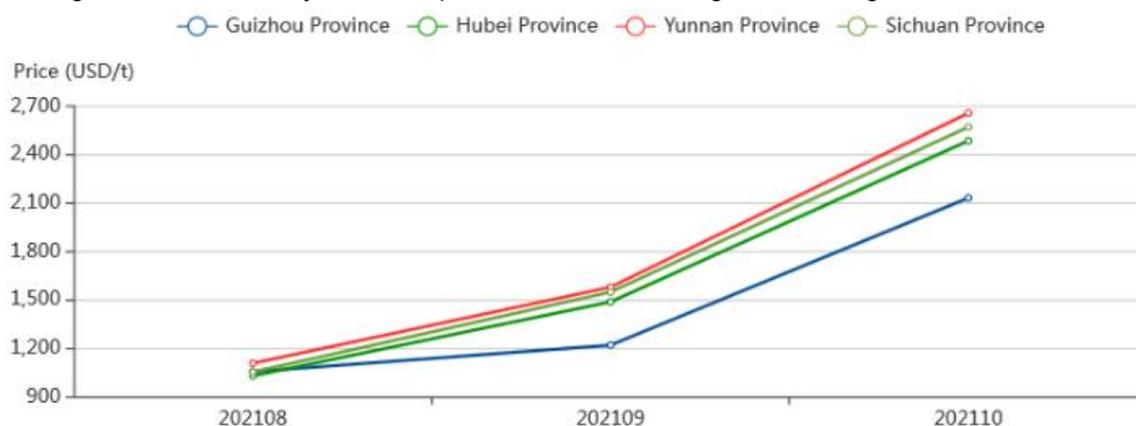
In general, the ex-works price of thermal-process PA showed a bigger increase due to the Dual Control policy while the wet-process PA reacted mildly.

In Sept., Yunnan government abruptly urged large cut to yellow phosphorus output in Sept.–Dec. Producers in Yunnan Province were asked to cut down 90% based on the output in Aug. The following skyrocketing price of yellow phosphorus panicked downstream sectors, which drove up the price of thermal-process PA.

The ex-works price of thermal-process PA went upward mainly because of two reasons. For one thing, some thermal-process PA producers were also asked to suspend production under the Dual Control policy, which tightened the thermal-process PA supply. For another, higher-priced yellow phosphorus continued to bring cost pressure to thermal-process PA producers.

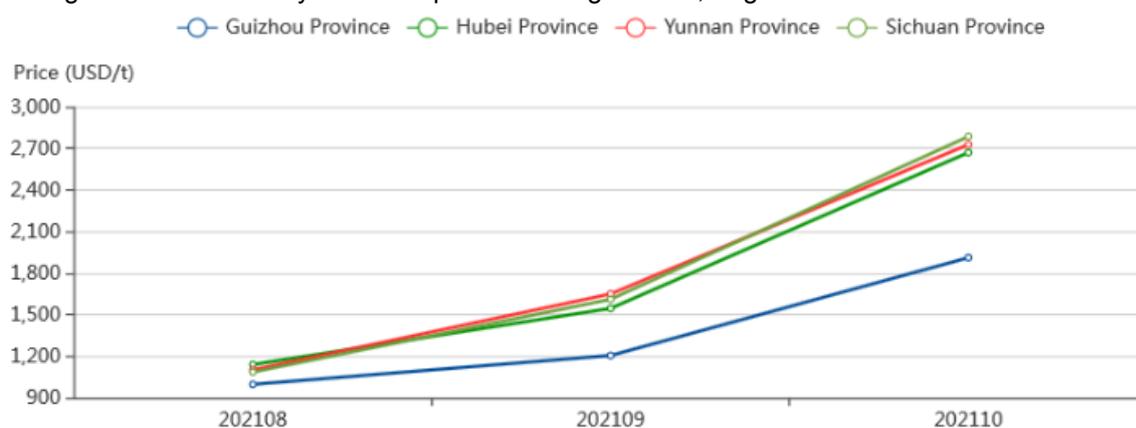
Wet-process PA witnessed smaller fluctuations in production and supply than thermal one, for it does not take yellow phosphorus as a raw material. That's why Guizhou Province had a slower and smaller growth in price than the other three provinces. However, with the rising price of thermal-process PA, there are chances for wet-process PA manufacturers to raise their quotations.

Figure 2.2.2-1 Monthly ex-works price of 85% industrial grade PA, Aug.–Oct. 2021



Note: Line Guizhou Province represents wet-process PA while the other three for the thermal-process PA.
Source: CCM

Figure 2.2.2-2 Monthly ex-works price of food grade PA, Aug.–Oct. 2021



Note: Line Guizhou Province represents wet-process PA while the other three for the thermal-process PA.
Source: CCM

2.3 Phosphate fertilisers

2.3.1 Production situation

Phosphate fertiliser production is scarcely affected by the electricity rationing, mainly due to a national strategy of securing chemical fertiliser supply and stabilising the price.

On 22 Sept., 2021, just a few days after the Dual Control policy was released, twelve national departments along with China National Railway Corporation jointly issued another notice to ensure stable supply and price of domestic fertilisers in the future. The notice mentions requirements related to production, storage, transportation, and circulation of fertilisers. Specifically, production requirements are as follows:

Fully guarantee supply of the raw materials for fertiliser production

All regions and some large central enterprises should attach great importance to fertiliser production, strengthen organisation & coordination, give priority to ensuring the supply of raw materials, energy and other factors of production to fertiliser producers, and provide more support for fertiliser enterprises supplying domestic market.

China Energy Investment Group Co., Ltd. and China Coal Energy Group Co., Ltd. should urge their affiliated coal companies to take appropriate measures. Local departments of

energy, industry and information technology in Inner Mongolia, Xinjiang, Shanxi, Shaanxi, Sichuan, Guizhou and Yunnan should actively guide local coal, sulphur, sulphuric acid and other key raw material suppliers to sign long-term agreements with key fertiliser producers, and push them to obey contracts to ensure adequate supply of stable-priced raw materials for fertiliser producers.

China National Petroleum Corporation (CNPC), China Petrochemical Corporation (Sinopec) and China National Offshore Oil Corporation (CNOOC) should strictly fulfill the natural gas supply contracts signed with fertiliser producers. They should also minimise the impact of gas reduction on fertiliser enterprises, and figure out a win-win cooperation mechanism between themselves and fertiliser producers. Power grid companies in large fertiliser producing regions such as Inner Mongolia, Henan, Shandong, and Yunnan should give priority to guaranteeing electricity for fertiliser production. Major sources of phosphorus ore like Yunnan, Guizhou and Hubei should allow qualified producers (in terms of environmental protection and safe production) to increase the output of phosphorus ore to satisfy the needs of phosphate fertiliser production in other provinces. CNPC, Sinopec and CNOOC should also give priority to ensuring sulphur supply, and keeping the price reasonable & stable.

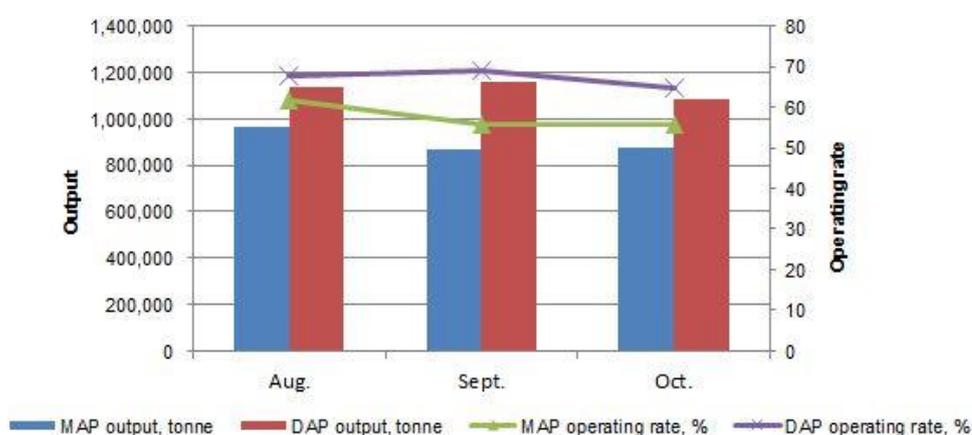
Improve capacity utilisation rate of fertiliser producers

Local development and reform commissions, departments of industry and information technology, and energy should give priority to ensuring energy supply for key fertiliser factories each with capacity exceeding 600,000 t/a to supply domestic fertiliser market. Fertiliser producers are allowed to maintain operation at full load and the energy supply needed could be arranged within a province.

Local ecology and environment departments, adhering to the requirements of the *Technical Guide for the Emergency Emission Reduction Measures for Key Industries in Heavy Pollution Weather*, may manage grade A and grade B fertiliser enterprises as livelihood safeguarding enterprises and allow them to autonomously reduce emissions during heavy pollution period in autumn and winter.

In addition, Guizhou, Sichuan and other regions subject to the "disposal determines output" policy of phosphogypsum, should take care of the phosphate fertiliser production needs in peak season, and adjust enterprises' monthly and quarterly evaluation index of added amount of phosphogypsum while ensuring that the total annual phosphogypsum control targets of phosphate fertiliser enterprises will not edge up. Local governments can formulate harmless treatment plans for phosphogypsum according to local conditions, encourage enterprises to utilise phosphogypsum to facilitate ecological restoration; enterprises may be allowed to store or dispose of phosphogypsum in accordance with national environmental protection standards for those that cannot be utilised.

Figure 2.3.1-1 Monthly output and operating rate of MAP & DAP in China, Aug.–Oct. 2021



Source: CCM

Table 2.3.1-1 Production of major MAP producers in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Xinyangfeng Agricultural Technology Co., Ltd.	Hubei, Sichuan	1,800,000	12,000,000	Barely affected
2	Hubei Xiangyun (Group) Chemical Co., Ltd.	Hubei	1,200,000	11,000,000	Barely affected
3	Anhui Sierite Fertilizer Industry Co., Ltd.	Ahnui	850,000	7,000,000	Barely affected
4	Sichuan Lomon Phosphorus Chemistry Co., Ltd.	Sichuan	800,000	6,500,000	Barely affected
5	Yunnan Yuntianhua Co., Ltd.	Yunnan	700,000	6,000,000	Barely affected

Source: CCM

Table 2.3.1-2 Production of major DAP producers in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Yunnan Yuntianhua Co., Ltd.	Yunnan	4,450,000	4,150,000	Barely affected
2	Guizhou Kailin Group Co., Ltd.	Guizhou	4,200,000	2,200,000	Barely affected
3	Wengfu (Group) Co., Ltd.	Sichuan, Guizhou, Gansu, Fujian	2,620,000	1,300,000	Barely affected
4	Hubei Yihua Chemical Industry Co., Ltd.	Hubei	1,260,000	1,100,000	Barely affected
5	Yunnan Xiangfeng Group Co., Ltd.	Yunnan	1,000,000	650,000	Barely affected

Source: CCM

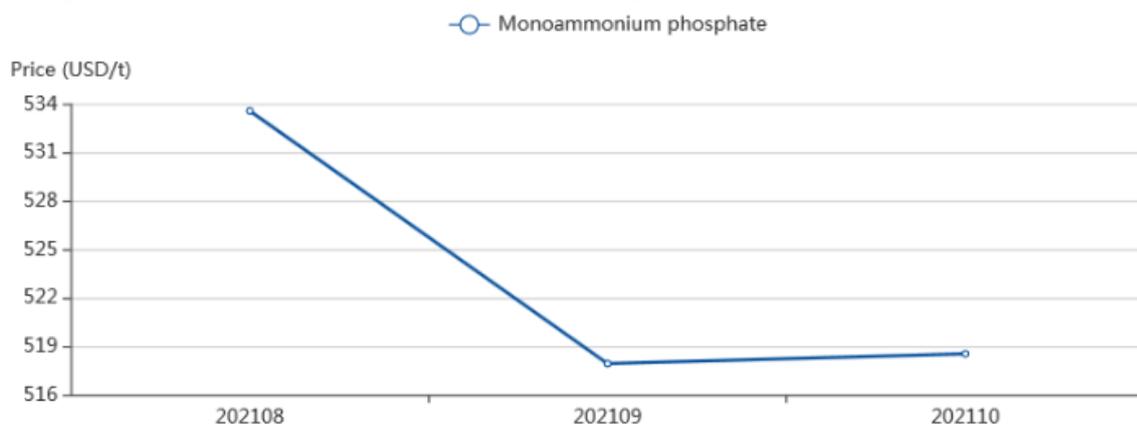
2.3.2 Price analysis

Price of phosphate fertilisers has been scarcely affected by the power rationing, since the supply has been quite stable. The operation model also matters. An overwhelming majority of

phosphate fertiliser producers in China adopt a "phosphorus ore—wet-process PA—phosphate fertilizers" industrial integration model, by which they can make their supply chain less affected by cost factor.

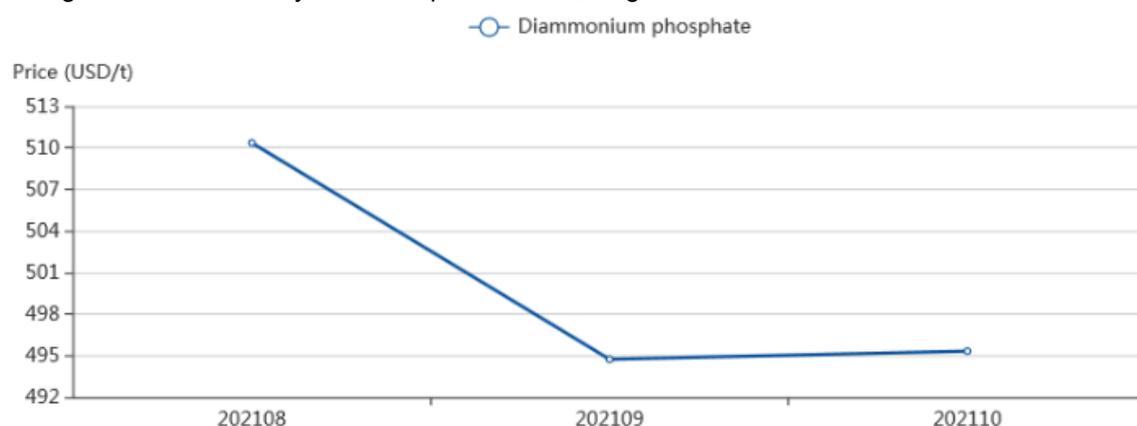
Prices of MAP and DAP are more demand-driven than cost-driven. During Aug.–Oct. 2021, domestic demand for the two products was relatively weak, so their prices went downward overall, quite opposite to the trend seen in yellow phosphorus and PA.

Figure 2.3.2-1 Monthly ex-works price of MAP, Aug.–Oct. 2021



Source: CCM

Figure 2.3.2-2 Monthly ex-works price of DAP, Aug.–Oct. 2021



Source: CCM

Another policy factor has a much greater impact on MAP and DAP production & price than electricity rationing. On 13 Oct., 2021, General Administration of Customs of the People's Republic of China (GACC) announced to make amendments to the catalogue of imported & exported commodities subject to compulsory inspection. Export inspection shall be carried out on commodities under 29 10-digit HS codes concerning chemical fertilisers by the Customs. This decision came into effect on 15 Oct., 2021. In general, this adds more difficulties and cost to chemical fertiliser export.

Table 2.3.2-1 Phosphate fertilisers subject to import & export inspection

No.	HS Code	Item	Current supervision requirement	Supervision requirement after adjustment
1	3103111000	Calcium triple superphosphate (containing P2O5 no less than 35% by weight)	A	A/B
2	3103119000	Other calcium superphosphates (containing P2O5 no less than 35% by weight)	A	A/B
3	3103190000	Other calcium superphosphates	A	A/B
4	3103900000	Other mineral or chemical phosphate fertilisers	/	B
5	3105300010	Diammonium phosphate (in-quota)	A	A/B
6	3105300090	Diammonium phosphate (out-of-quota)	A	A/B
7	3105400000	Ammonium dihydrogen phosphate (including mixture of ammonium dihydrogen phosphate and diammonium phosphate)	A	A/B

Note: 1. Supervision requirement "A": commodities shall be subject to import inspection by the Customs.

2. Supervision requirement "B": commodities shall be subject to export inspection by the Customs.

Source: General Administration of Customs of the People's Republic of China

2.4 Phosphorus trichloride & Phosphorus oxychloride

2.4.1 Production situation

Under the influence of electricity rationing and production suspension in Jiangsu, Shandong and other provinces, many phosphorus trichloride and phosphorus oxychloride producers notified their production suspension or large production cut. Outputs and operating rates of the two products in Sept. and Oct. declined compared with those in Aug.

Phosphorus trichloride

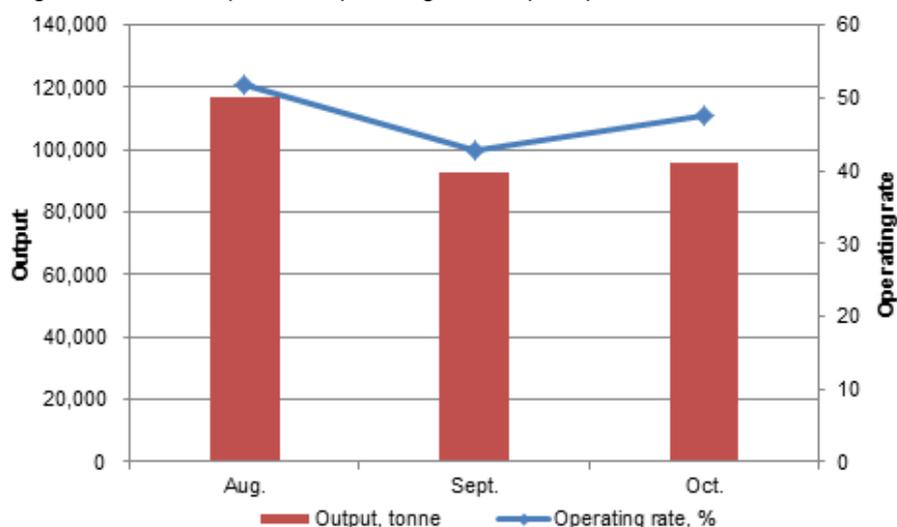
In Jan.–Oct. 2021, the output of phosphorus trichloride was about 1,170,000 tonnes in China. In particular, Aug., Sept. and Oct. registered an output of 116,900 tonnes, 93,000 tonnes and 96,000 tonnes respectively. Main reasons for the decline are as follows:

- First, operating rates in phosphorus trichloride enterprises dropped sharply, affected by the the shortage of yellow phosphorus and high price, as well as electricity rationing policies.
- Second, growing production cost also drove up the price of phosphorus trichloride. However, downstream companies could seldom accept such a high price, so their orders decreased. As a result, phosphorus trichloride enterprises chose to reduce or suspend production.

Jiangsu and Zhejiang provinces boast more than 40% of the total phosphorus trichloride capacity in China. Starting from 16 Sept., the producers in Jiangsu Province stopped production on a large scale and the output there dropped significantly. In general, the operating rates in Jiangsu and Zhejiang provinces dropped to around 25%. The rates increased slightly in Oct. as a few enterprises resumed production after the National Day holiday.

The operating rate in Shandong and Henan provinces also fell rapidly in Sept., which pushed the market supply tighter. Entering Oct., operation in these two provinces improved.

Figure 2.4.1-1 Output and operating rate of phosphorus trichloride in China, Aug.–Oct. 2021



Source: CCM

Table 2.4.1-1 Production of major producers of phosphorus trichloride in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Taixing Xing'an Fine Chemicals Co., Ltd.	Jiangsu	160,000	68,000	Suspension
2	Nantong Jiangshan Agrochemical and Chemicals Co., Ltd.	Jiangsu	160,000	67,000	Suspension
3	Xuzhou Jianping Chemical Industry Co., Ltd.	Jiangsu	100,000	42,000	Suspension
4	Henan Qingshuiyuan Technology Co., Ltd.	Henan	60,000	31,000	Barely affected
5	Jiangsu Tianyuan Chemicals Co., Ltd.	Jiangsu	50,000	23,000	Suspension
6	Tai'an Yarong Biotechnology Co., Ltd.	Shandong	34,000	15,000	Production restriction
7	Tongshan Hongda Fine Chemical Factory	Jiangsu	30,000	13,000	Suspension
8	Taizhou Yongchang Chemical Co., Ltd.	Jiangsu	16,000	7,000	Suspension
9	Shandong Huayang Pesticide Chemical Industry Group Co., Ltd.	Shandong	10,000	5,000	Production restriction
10	Hunan Hengguang Technology Co., Ltd.	Hunan	10,000	3,700	Barely affected

Source: CCM

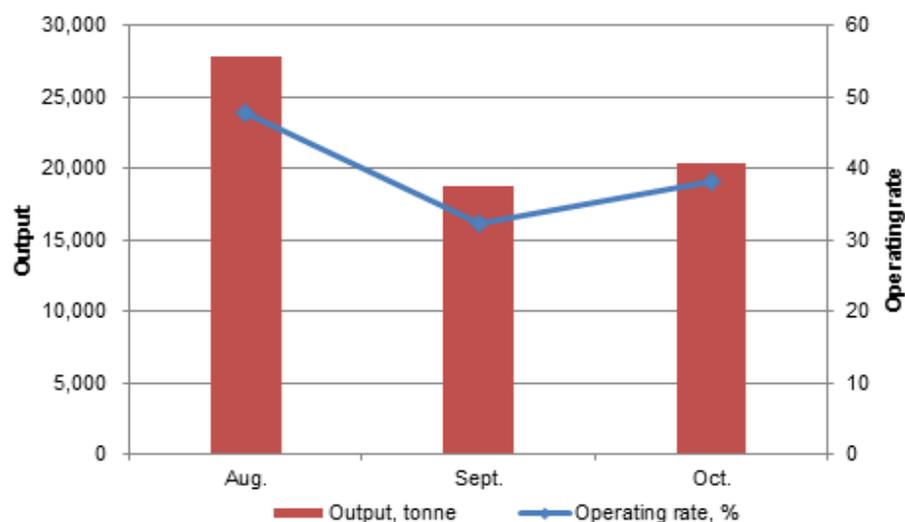
Phosphorus oxychloride

In Jan.–Oct. 2021, the output of phosphorus oxychloride was approximately 280,000 tonnes in China. In particular, Aug., Sept. and Oct. registered an output of some 27,800 tonnes, 18,800 tonnes and 20,300 tonnes respectively.

In Aug.–Oct., the operating rate of phosphorus oxychloride declined, and the market supply was tight. Before Sept., monthly operating rate basically fluctuated around 50%. In Sept., the

operating rate has dropped sharply, to about 32%. Phosphorus oxychloride enterprises in Jiangsu Province stopped or reduced production on a large scale, resulting in a significant reduction in the output and a tight market supply.

Figure 2.4.1-2 Output and operating rate of phosphorus oxychloride in China, Aug.–Oct. 2021



Source: CCM

Table 2.4.1-2 Production of major producer of phosphorus oxychloride in China, as of Oct. 2021

No.	Producer	Production base	Capacity, t/a	Output, tonne	Note
1	Jiangsu Tianyuan Chemicals Co., Ltd.	Jiangsu	80,000	28,000	Suspension
2	Taixing Xing'an Fine Chemicals Co., Ltd.	Jiangsu	50,000	19,000	Suspension
3	Jiangsu Yoke Technology Co., Ltd.	Jiangsu	50,000	18,750	Suspension
4	Xuzhou Jianping Chemical Industry Co., Ltd.	Jiangsu	50,000	17,500	Suspension
5	Tai'an Yarong Biotechnology Co., Ltd.	Shandong	30,000	12,500	Production restriction
6	Futong Chemical Co., Ltd.	Jiangsu	30,000	10,500	Suspension
7	Taizhou Yongchang Chemical Co., Ltd.	Jiangsu	16,000	5,900	Suspension
8	Ningguo Jiutian Chemicals Co., Ltd.	Anhui	10,000	4,400	Barely affected
9	Jiangxi Electrochemical Lefeng Chemical Co., Ltd.	Jiangxi	5,000	2,300	Production restriction
10	Jilin Jihua Beifang Lianteng Chemical Co., Ltd.	Jilin	5,000	2,300	Barely affected

Source: CCM

2.4.2 Price analysis

The gap between demand and supply of yellow phosphorus has widened and its price soared, owing to the electricity rationing in Yunnan and Guizhou provinces. As a result, prices

of downstream products of yellow phosphorus also increased.

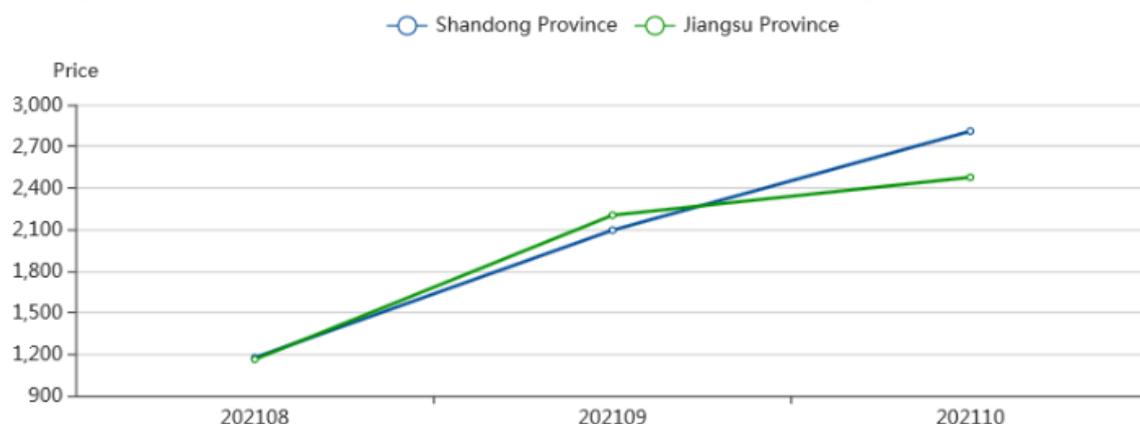
Phosphorus trichloride

Monthly average ex-works price of phosphorus trichloride reached USD2,998/t in Oct. in China, more than double the price of USD1,146/t in Aug. The sharp increase mainly comes from:

- Raw material cost: the soaring price of yellow phosphorus prompted up production cost of phosphorus trichloride.
- Reduced supply: phosphorus trichloride production in Jiangsu Province was significantly restricted, which left expanding supply gap in the market and increases in the price.

In Aug., the ex-works price of phosphorus trichloride was rather stable, since the downstream demand was flat, basically fluctuating around USD1,146/t. Starting from 13 Sept., the price began to rise sharply and quickly rose to USD3,092/t–USD3,556/t on 17; it stayed at a high level till mid-Oct. Then, some phosphorus trichloride enterprises in Jiangsu Province resumed production, so the price declined in mid of slowly edging up supply. To the end of Oct., the price came to around USD2,322/t, still supported by the high production cost.

Figure 2.4.2-1 Ex-works price of phosphorus trichloride in China, Aug.–Oct. 2021



Source: CCM

The costs of yellow phosphorus and liquid chlorine take up 88% and 12% respectively of the total raw material cost in phosphorus trichloride production. Since Sept., the price of liquid chlorine also experienced big jumps due to short supply resulted from declined operation of liquid chlorine companies. Seeing more expensive yellow phosphorus and liquid chlorine, raw material cost of phosphorus trichloride in Oct. doubled from the Aug. level.

However, the rises in phosphorus trichloride price outgrew the additions to raw material cost. There was relatively larger room for profit increase.

Table 2.4.2-1 Estimated raw material costs of phosphorus trichloride, Aug.–Oct. 2021

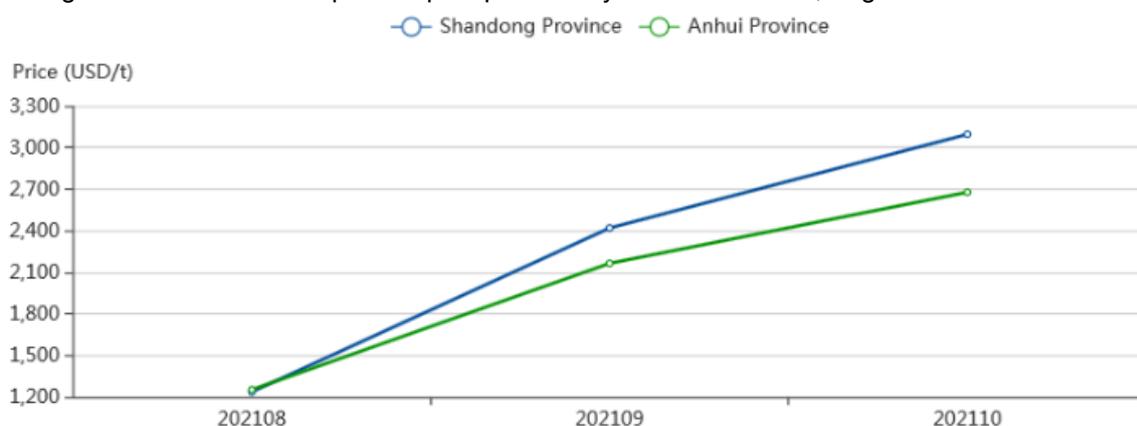
Month	Aug.		Sept.		Oct.	
Raw material	Yellow phosphorus (t)	Liquid chlorine (t)	Yellow phosphorus (t)	Liquid chlorine (t)	Yellow phosphorus (t)	Liquid chlorine (t)
Unit consumption (/t)	0.23	0.85	0.23	0.85	0.23	0.85
Price (USD/t)	3,744.00	149.24	6,462.00	192.49	7,625.07	267.01
Cost (USD/t)	842.40	126.85	1,453.95	163.62	1,715.64	226.96
Total cost (USD/t)	969.25		1,617.57		1,942.60	

Source: CCM

Phosphorus oxychloride

In Aug., phosphorus oxychloride enterprises in Jiangsu, Shandong, Anhui and other provinces have maintained normal production. But most of the producers in Jiangsu Province temporarily stopped quoting in Aug. Judging from the ex-works prices in Shandong and Anhui, monthly average price of phosphorus oxychloride fluctuated slightly in Aug., at USD1,237/t. Through Sept., the price rose significantly, with a month-on-month increase of more than 70%. The prices in Shandong and Anhui reached USD2,165/t and USD2,420/t respectively. In Oct., the output of phosphorus oxychloride increased slightly, but the market supply was still tight, which drove its price to rise again.

Figure 2.4.2-2 Ex-works price of phosphorus oxychloride in China, Aug.–Oct. 2021



Source: CCM

3 Market outlook

Against the backdrop of Dual Control policy on energy consumption & energy intensity, operation in enterprises in energy-intensive businesses such as yellow phosphorus and thermal-process phosphoric acid will be greatly affected in the short term, and will continue to be limited in the long term. Towards the end of 2021, provinces that have not reached the reduction goals of energy consumption & energy intensity will inevitably take more stringent measures, which would cause production cut or suspension in relevant companies again. In the long run, capacity in these energy-intensive industries is expected to be restricted, and outdated capacity be eliminated.

With accelerated release of coal capacity, significant results have been achieved in increasing production and supply of various raw materials. Entering Nov., although there are still rationing imposed on some energy-intensive industries in some provinces, tension between electricity supply and demand in China has eased. Current operating rate of phosphorous chemicals enterprises has obviously increased compared with that in Sept.

Main production bases of yellow phosphorus—Yunnan, Guizhou and Sichuan provinces have entered dry season. It is expected that the supply of yellow phosphorus will not increase rapidly and on a large scale until Q1 2022. With gradual recovery in downstream industries, demand for yellow phosphorus has been on the rise, and the tight supply situation may continue. As electricity price may be raised in dry season, it is predicted that by Q1 2022, the price of yellow phosphorus will remain at a high level, within the range of USD6,186/t–USD7,733/t.

At present, price increase of phosphate fertilisers slowed down, due to the poor downstream demand and limited export. However, there is no oversupply concern for the time being as operating rates in phosphate fertiliser enterprises are not high. Demand for phosphate fertilisers is expected to increase, with the arrival of stockpiling season in winter. It is expected that the price of phosphate fertilisers will fluctuate in the next three months, but the fluctuation will not be large.

Phosphoric acid and phosphorus trichloride enterprises have gradually increased their operating rates, and their production cost will decrease along with declining raw material price. It is expected that the prices of phosphoric acid and phosphorus trichloride will slightly slip in the next three months. Operating rates in phosphorus oxychloride enterprises have increased significantly, and the price is expected to return to the level before the electricity rationing.

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