

Production of Citric Acid and Sodium Citrate in China

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Researched & Prepared by:

Kcomber Inc.

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Basic info of citric acid producers

Chinese name	English name	Abbreviation	Location
山东英轩实业股份有限公司	Shandong Ensign Industry Co., Ltd.	Shandong Ensign	Shandong
日照金禾生化集团股份有限公司	RZBC Group Co., Ltd.	RZBC	Shandong
山东柠檬生化有限公司	Shandong TTCA Co., Ltd.	TTCA	Shandong
江苏国信协联能源有限公司	Jiangsu Guoxin Union Energy Co., Ltd.	Guoxin Union	Jiangsu
吉林协联生物科技有限公司	Jilin Union Biotechnology Co., Ltd.	Jilin Union	Jilin
中粮生物科技股份有限公司	COFCO Biotechnology Co., Ltd.	COFCO	Jilin
莱芜泰禾生化有限公司	Laiwu Taihe Biochemistry Co., Ltd.	Laiwu Taihe	Shandong
七星柠檬科技有限公司	Seven Stars Citric Acid Technology Co., Ltd.	Seven Stars	Shandong

1 Summary of citric acid and sodium citrate production

Table 1-1 Capacity and output of citric acid producers in China, 2020–2022

No.	Producer	Capacity, t/a			Output, tonne			Operating rate 2022	Self-consumption volume, tonne	Sales, tonne
		2020	2021	2022	2020	2021	2022			
1	Shandong Ensign	600,000	600,000	1,000,000	450,000	500,000	593,000	59%	102,200	490,800
2	RZBC	370,000	370,000	370,000	265,000	320,000	323,000	87%	48,300	274,700
3	TTCA	350,000	350,000	350,000	224,000	270,000	318,000	91%	9,100	308,900
4	Guoxin Union	180,000	180,000	180,000	162,000	152,000	165,000	92%	17,500	147,500
5	COFCO	180,000	180,000	120,000	140,000	124,000	117,000	98%	-	117,000
6	Laiwu Taihe	160,000	160,000	160,000	110,000	110,000	118,000	74%	29,300	88,700
7	Seven Stars	100,000	100,000	100,000	35,000	73,000	83,000	83%	5,600	77,400
Total		1,940,000	1,940,000	2,280,000	1,386,000	1,549,000	1,717,000	75%	212,000	1,505,000

Note: 1) The capacity and output of refined citric acid produced from citric acid as starting raw material is excluded.

2) Capacity of citric acid includes that of citrate, same as the output.

Source: CCM

Table 1-2 Capacity and output of sodium citrate producers in China, 2020–2022

No.	Producer	Capacity, t/a			Output, tonne		
		2020	2021	2022	2020	2021	2022
1	Shandong Ensign	100,000	100,000	300,000	88,000	95,000	104,000
2	RZBC	80,000	80,000	80,000	34,000	50,000	53,000
6	TTCA	30,000	30,000	30,000	5,000	10,000	13,000
4	Guoxin Union	36,000	36,000	36,000	22,500	22,000	25,000
5	COFCO	15,000	15,000	0	14,800	14,000	0
3	Laiwu Taihe	60,000	60,000	60,000	33,500	36,000	38,000
7	Seven Stars	12,000	12,000	12,000	5,000	7,000	8,000
Total		333,000	333,000	518,000	202,800	234,000	241,000

Note: 1) The capacity and output of refined sodium citrate produced from sodium citrate as starting raw material is excluded.

2) The company which does not have citric acid capacity is excluded.

Source: CCM

The capacity of citric acid has become concentrated in large producers, and there were only seven active citric acid producers as of February 2023.

The industry operating rate of citric acid was relatively high, before 2018. The operating rate decreased to 79% in 2018, 71% in 2019 and 71% in 2020, along with the launch of new projects and expansion projects totaling 275,000 t/a (RZBC and TTCA) in 2018 and 240,000 t/a (Shandong Ensign, Seven Stars) in 2019. The operating rate was about 80% in 2021, driven by rapidly growing demand beyond China. In 2022, though the demand beyond China kept increasing, the operating rate decreased to about 75% as Shandong Ensign's 400,000 t/a citric acid was built up and put into production.

China's output of citric acid reached about 1.72 million tonnes in 2022, an increase of 168,000 tonnes from 2021, mainly driven by the increasing export volume. China's export volume of citric acid in 2022 saw an increase of 160,800 tonnes over 2021, in the presence of a global supply shortfall caused by the raging pandemic and energy disruption.

A citric acid producer is often a producer of sodium citrate. As of Feb. 2023, there were only seven active sodium citrate producers (processors are excluded) in China. The output of sodium citrate increased with a CAGR of 7.5% in 2018–2022, driven by the development of the domestic detergent and food industries as well as increasing overseas demand.

2 Key manufacturers' production information

Shandong Ensign expanded its citric acid capacity from 460,000 t/a to 600,000 t/a in May 2020. Shandong Ensign uses part of its citric acid to make citrates at a maximum of 120,000 t/a, which contains 100,000 t/a sodium citrate.

Shandong Ensign proposed a green intelligent manufacturing project of 400,000 t/a refined citric acid (400,000 t/a citric acid, 250,000 t/a citrates, etc.), and 140,000 t/a citric acid will be used to manufacture citrates. This project was started in Sept. 2020, and built up in H2 2022.

Shandong Ensign also launched a green intelligent upgrading project of 700,000 t/a citric acid (No details. CCM thinks the original capacity of 600,000 t/a will be expanded to 700,000 t/a) in Jan. 2023.

Link of expansion project:

http://www.changle.gov.cn/CLXXXGK/XXZFWJ/202302/t20230220_780143.html

http://www.changle.gov.cn/CLXXXGK/XGTJ/202302/t20230206_779352.html

RZBC (Boyuan) Biochemical Co., Ltd. (RZBC Boyuan) once had a production line only producing citric acid (capacity: 180,000 t/a) and 40,000 t/a sodium citrate production line, in which the 40,000 t/a sodium citrate production line equipped with additional citric acid synthesis device. In 2015, RZBC Group Co., Ltd. (RZBC) made a re-arrangement to its subsidiaries, so

RZBC (Luxin) Co., Ltd. dismantled the outdated 140,000 t/a citric acid production line that year; a make-up production work was then entrusted to RZBC Boyuan. In 2019, the 140,000 t/a citric acid production line in RZBC Boyuan was put into commercial production. RZBC Boyuan started the citrate energy-saving technical transformation project (50,000 t/a citric acid was replaced by 60,000 t/a sodium citrate, 40,000 t/a sodium citrate was replaced by 20,000 t/a sodium citrate and 20,000 t/a potassium citrate) at the end of 2019, which was built up in May 2020. RZBC Boyuan also proposed a technical transformation project of 30,000 t/a citrate, and the 1st phase (20,000 t/a calcium citrate, 1,000 t/a magnesium citrate) was built up in October 2021.

RZBC Boyuan proposed to expand the capacity of citric acid. On 20 Sept., 2022, it publicized the environmental impact (EI) report of the 200,000 t/a citric acid project.

Link of expansion project:

http://www.juxian.gov.cn/art/2022/9/20/art_163432_10324100.html

http://www.juxian.gov.cn/art/2022/12/27/art_163432_10337138.html

TTCA once had a production line only producing citric acid (capacity: 185,000 t/a) and a 30,000 t/a sodium citrate production line (equipped with an additional citric acid synthesis device). TTCA's 135,000 t/a citric acid expansion project was finished and put into production in 2019. The company has no expansion plan for citric acid, but proposed a 300,000 t/a pea protein project.

Guoxin Union had a production line only producing citric acid (capacity: 180,000 t/a) and a 30,000 t/a sodium citrate production line (equipped with an additional citric acid synthesis device). Jilin Union Biotechnology Co., Ltd. (Jilin Union) started the construction of *the 150,000 t/a citric acid project (Phase I: a production line for 75,000 t/a citric acid, Phase II: a production line for 75,000 t/a citric acid and citrate)* in April 2022.

Link of expansion project:

http://www.jlzhelai.gov.cn/ztlz/hjbh/xmgq/202202/t20220225_929000.html

COFCO currently has two production bases in China, namely Ma'anshan City in Anhui Province and Changchun City in Jilin Province. Specifically,

- 1) Production base in Changchun City has a production line only producing citric acid (capacity: 120,000 t/a), which was put into production in June 2018.
- 2) Production base in Ma'anshan City has a production line only producing citric acid (capacity: 45,000 t/a), but they could use part of it to make sodium citrate at a maximum of 15,000 t/a. This production base started the technical transformation project of 60,000 t/a citric acid (converted to citric acid monohydrate, including 28,000 t/a anhydrous citric acid, 20,000 t/a citric acid monohydrate, and 12,000 t/a sodium citrate), which pass the environmental protection completion acceptance in 2019 (actually, this project was completed several years ago). Due to outdated technology and a low degree of automation, this citric acid production has been eliminated and replaced by the HFCS line in 2021.
- 3) Production base in Bengbu City once had a production line only producing citric acid

(capacity: 120,000 t/a), part of which can be used to make sodium citrate at a maximum of 60,000 t/a. A planned relocation to the Bengbu Fine Chemical High-tech Industrial Base is still underway. The old plant completely stopped the production of citric acid and sodium citrate in 2019. The relocation project with a citric acid capacity of 60,000 t/a in the Bengbu Fine Chemical High-tech Industrial Base had not been built yet as of March 2022.

Link of expansion project: <http://chq.mas.gov.cn/xxfb/xwzx/tzgg/9744647.html>

Table 2-1 Profitability of COFCO Biotechnology Co., Ltd., 2019–2021

Citric acid, citrate and its by-product	2019	2020	2021
Revenue, USD	116,225,539	102,305,745	175,844,418
Cost of sales, USD	112,884,003	92,895,721	133,885,793
Operating profit, USD	3,341,536	9,410,024	39,131,063
Gross profit margin	3%	9%	22%

Note: COFCO Biochemical (Thailand) Co., Ltd. is included.

Source: Annual reports of COFCO Biotechnology Co., Ltd.

Laiwu Taihe has a production line only producing citric acid (capacity: 100,000 t/a) and a 60,000 t/a sodium citrate production line. The two production lines share the same production process in the early citric acid synthesis. Laiwu Taihe added a refined sodium citrate production line with a 2,000 t/a capacity at the end of 2018, using sodium citrate as material.

Seven Stars, founded on 19 Jan., 2018, planned to build a food additive project (500,000 t/a) in two phases. Phase I includes 88,000 t/a of citric acid (44,000 t/a of anhydrous citric acid and 44,000 t/a of citric acid monohydrate) and 12,000 t/a of sodium citrate, which started in 2018 and was put into trial production in Sept. 2019. Phase II includes 352,000 t/a of citric acid (176,000 t/a of anhydrous citric acid and 176,000 t/a of citric acid monohydrate), 48,000 t/a of sodium citrate and 160,000 t/a citric acid gluten feed (by-product), with two stages for the construction.

✓ 1st stage of Phase II (200,000 t/a citric acid and citrate): Delayed, may go into operation in 2023.

✓ 2nd stage of Phase II (also 200,000 t/a citric acid and citrate): be up and running in 2024.

Seven Stars takes the mother liquor of citric acid monohydrate to produce sodium citrate.

Link of expansion project:

<http://www.yishui.gov.cn/info/1084/168996.htm>

3 Forecast on citric acid and sodium citrate production in China

Domestic capacity ranking of citric acid and sodium citrate unchanged in 2022.

A total capacity of about 1,000,000 t/a citric acid will be built up and released in 2023–2026, if all these potential projects are processing well as expected.

Qiqihar Longjiang Fufeng Biotechnology Co., Ltd., founded on 3 March, 2017, planned to build a corn deep processing project (capacity: 3 million t/a) which was divided into three phases. Only the 3rd phase involves the construction of a 500,000 t/a citric acid production line. The first and second phases have been completed as of December 2020, and the 3rd phase is still in the preparation of the feasibility study.

Inner Mongolia Meca Biotechnology Co., Ltd., established in Sept., 2019, planned to build a 2,000,000 t/a corn deep processing industrial park with a construction period from 2019 to 2023, which was divided into two phases. Only the 2nd phase involves the construction of 300,000 t/a citric acid and citrates (100,000 t/a anhydrous citric acid, 150,000 t/a monohydrate citric and 50,000 t/a sodium citrate). The 1st phase 600,000 t/a fuel ethanol is still under construction as of Feb. 2023, and there is no progress regarding the 2nd phase (the product may be adjusted from citric acid to lactic acid & polylactic acid).

Link of expansion project:

<http://fgw.xam.gov.cn/fgw/1119945/zdjsxm17/3589829/index.html>

There is no further information on the following three projects, which completed record filing only.

Shandong Sanyuan Biotechnology Co., Ltd. was granted record-filing of its 100,000 t/a citric acid technology transformation project on 11 July, 2022.

Link of new project:

<http://www.bzsanyuan.com/news/shownews.php?lang=cn&id=64>
<http://221.214.94.51:8081/icity/ipro/fmxmlgs?sqlid=A30D3985AF184E64AC868C0B70061879&bsnum=DAABA3B3BA8A4D769C309BD0401D2778>

Rizhao Haoyu Biotechnology Co., Ltd. (Haoyu Biotech)'s 1,000,000 t/a citric acid project was also put on record on 27 July, 2022.

Link of new project:

<http://221.214.94.51:8081/icity/ipro/fmxmlgs?sqlid=B67FF6410F9B4B65B4F64C3297422E47&bsnum=8818328BA630421ABFED4B98F6673469>

Hunchun Border Economic Cooperation Zone Infrastructure Investment Co., Ltd. was granted record-filing of a 500,000 t/a citric acid project on 13 July, 2023.

Link of new project:

<https://tzxm.jl.gov.cn/indexjl.jsp>

Table 3-1 Citric acid capacity forecast to 2026

No.	Company	Capacity, '000 t/a						
		2020	2021	2022	2023	2024	2025	2026
1	Shandong Ensign	600	600	1,000	1,000	1,100	1,100	1,100
2	RZBC	370	370	370	370	570	570	570
3	TTCA	350	350	350	350	350	350	350
4	Guoxin Union & Jilin Union	180	180	180	255	330	330	330
5	COFCO	180	180	120	120	120	120	120
6	Laiwu Taihe	160	160	160	160	160	160	160
7	Seven Stars	100	100	100	300	500	500	500
8	Qiqihar Longjiang Fufeng Biotechnology Co., Ltd.	/	/	/	/	/	/	/
9	Inner Mongolia Meca Biotechnology Co., Ltd.	/	/	/	/	/	/	/
Total		1,940	1,940	2,280	2,550	3,130	3,130	3,130

Source: CCM

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17th Floor, Huihua Commercial & Trade Building, No. 80 Xianlie Zhong Road Guangzhou,
510070, P.R.China

Website: <http://www.cnchemicals.com>

Tel: +86-20-37616606

Fax: +86-20-37616968

Email: econtact@cnchemicals.com