

AN IRRESISTIBLE TREND THE APPLICATION PROSPECT OF INK-JET PRINTING TECHNOLOGY IN CHINA'S CERAMIC INDUSTRY

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1. THE RAPID DEVELOPMENT OF INK-JET PRINTING TECHNOLOGY IN CHINA

- **2008:** Chinese experts and scholars who have paid attention to the development of overseas ceramic technology first found the ink-jet printer in the industrial exhibition in Europe.
- **2009:** Hangzhou Nabel Group Co., Ltd purchased ink-jet printers from KERAjet and put them into production in May in Hangzhou.
- **2010:** Guangdong Gold Ceramic Co., Ltd started the rapid development of China's ink-jet printing technology by unveiling its first ink-jet tile; there were 12 ink-jet printers in China at the end of 2010.

- **2011:** The technology began to spread in China; 80 more ink-jet printers were set up; domestic ink producers Mris and Mindst officially launched their ink products.
- **2012:** The technology stirred an upsurge in the ceramic industry of China, where many regions brought in ink-jet printers to produce ink-jet tiles. This year can be seen as the “ink-jet year” of China. 620 ink-jet printers were newly set up, and the total ink-jet printers increased to 712 by the end of 2012; the domestic ink brand—Dowstone was born this year.
- **2013:** The technology maintains its momentum, and the rational and meticulous ceramic entrepreneurs began to think how to update production in the use of this technology; by the end of 2013, as many as 1630 ink-jet printers are operating with 918 being set up during the first 9 months (a shocking growth rate); another two domestic ink producers Create-tide and Win-time launched Beto Ink and Yuanmu Ink respectively, with others as well onto the market.

2. CHINA HAS BECOME THE BIGGEST MARKET OF GLOBAL INK-JET PRINTING TECHNOLOGY

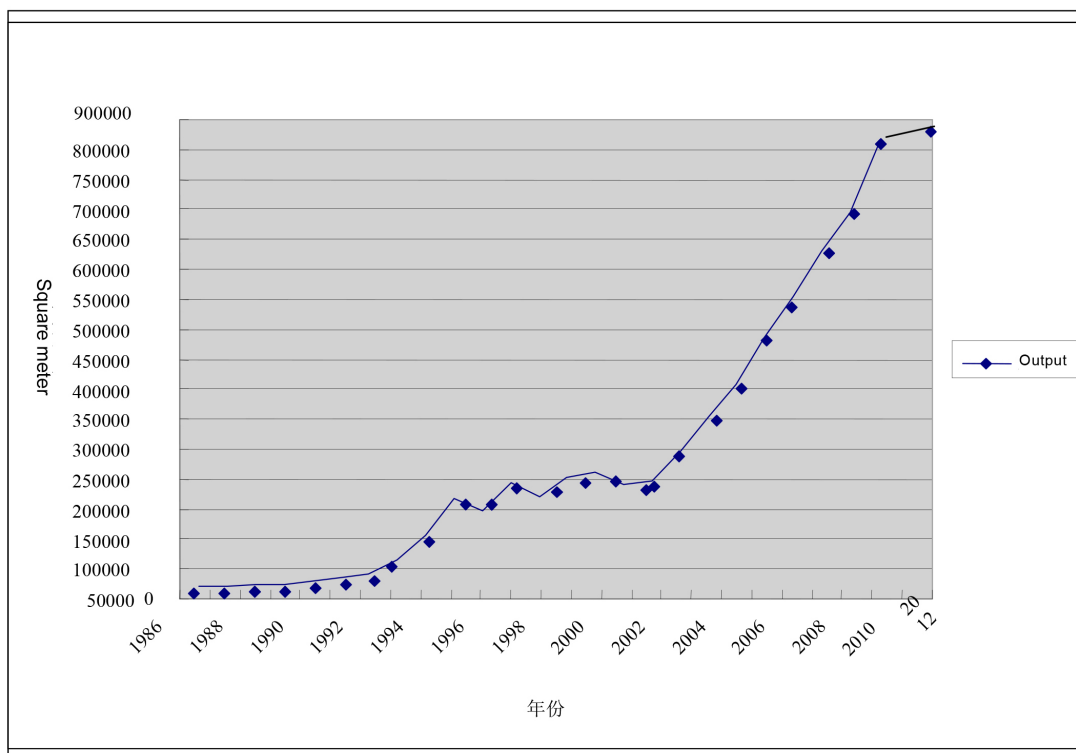
In the white-hot competition of ink-jet printing, China has grown to be the rapident and biggest market in the world.

REASONS

- **Output: China is the biggest tile producer.**

Year	2007	2008	2009	2010	2011	2012
Output (100 million square meters)	50.01	55.3	67.24	75.31	87.01	89.93

Trend Chart of China's tile output.



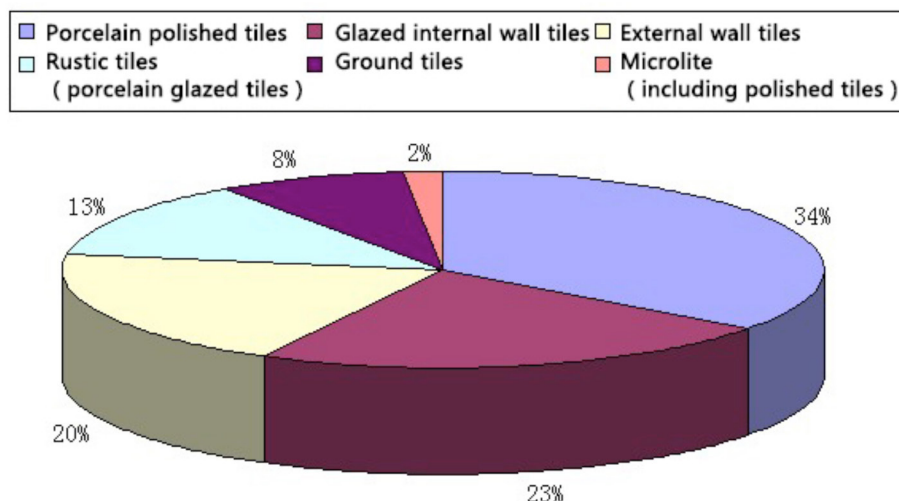
In 2012, global tile output was about 11.166 billion square meters, and the amount of all kinds of tiles of China accounts for 80%.

- **Production lines: China has the most tile production lines.**

There are about 3300 production lines of all kinds of tiles.

Product	Porcelain polished tiles	Glazed internal wall tiles	External wall tiles	Rustic tiles (porcelain glazed tiles)	Ground tiles	Microlite (including polished tiles)
Production lines	1000-1100	680-700	600-610	370-400	240-250	47-50

Up to now, two thirds of China's tile production lines are suitable for ink-jet printing technology, so its market is promising.



- **Technology edge: apple of the eyes of Chinese ceramic enterprises.**

1. Delicate products. This is the advantage that no other ceramic printers can compete with.
2. More flexible design. Large scale of design patterns without repetition is convenient for more design plans.
3. Increased quality rate. The ink, as standardized coloured glaze, has stable properties. Ink-jetting decreases tile damage owing to non-contact printing.
4. Less cost. What attracts most ceramic enterprises is that only computer colour matching test is needed to produce, which lower the demand of printing plate and craftsmen.

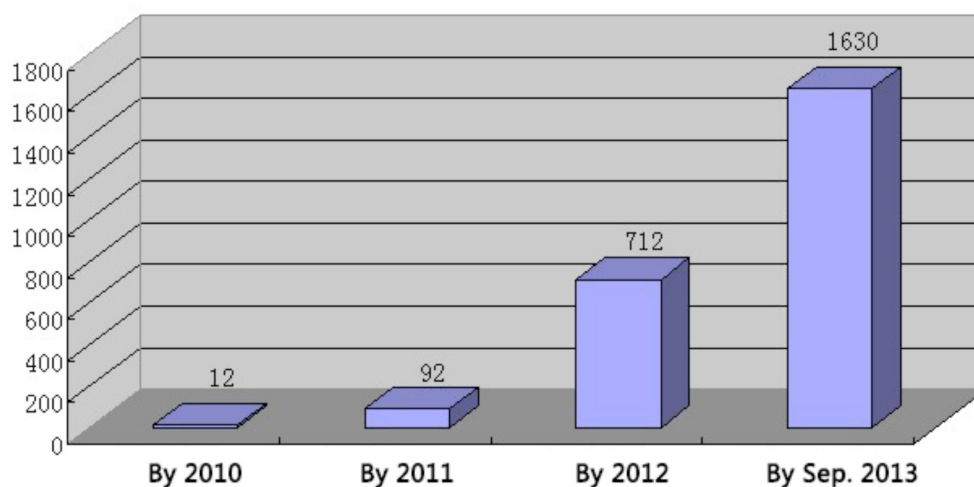
STATUS QUO

- **China uses the most ink-jet printers in the world.**

Time point	By the end of 2010	By the end of 2011	By the end of 2012	By the end of Sep. 2013
Amount of printers (set)	12	92	712	1630

According to the table, by the end of 2010, there were 12 ink-jet printers on line; this increased to 92 the following year and to 712 in 2012; 918 more sets were added during the first 9 months of 2013, totalling 1630. The increase rate in 2012 is nearly seven times that of 2011.

The amount of ink-jet printer in China



- Application of ink-jet printers in China.**

How it is	Most successful	To improve	Potential	To explore
Production types	Glazed internal wall tiles, polished tiles, microlites and wood tiles	Stoneware and rustic tiles	Polished tiles, external tiles and porcelain thin slabs	Seepage tiles, porcelain allotropes parts, porcelain pictures, mosaic and European roof tiles

- Seller-dominant market accelerates the growth of ink-jet printing technology in China.**

Many producers of ink-jet printers, ink and printheads are opening offices, companies and manufacturing basis in China for a strategic right of say. They enhance the promotion, research and development of the technology.

Active printer manufacturers in China:

Foreign: KERAjet, efi Cretaprint, SITI B&T, Sacmi, System, and Durst.

Domestic: Hope, Meijia. Teckwin, NKT, Flora, Kingtao, Donghai Digital, and Keyue.

Active ink manufacturers in China:

Foreign: Esmalglass-Itaca, Torrecid, Colorobbia, Ferro, Zschimmer & Schwarz, Megacolor and Fritta.

Domestic: Downstone, Mris, Mindst, WanXing, Create Tide, Fulin, Huilong, Sanrui, Yokon and Eastech.

Active printhead manufacturers in China:

Xaar, FUJIFILM Dimatix, Konica Minolta, SPT and Toshiba.

Thanks to the participation of Chinese enterprises in the technology competition, the general prices of global ink-jet printers and ink decrease gradually to reasonable, rational and stable levels. It means more profit for ceramic enterprises. Competition drives and accelerates technology to progress.

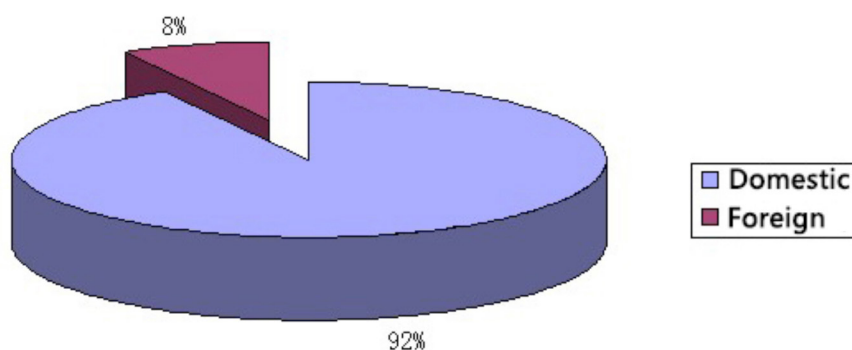
A. INK-JET PRINTER

- **There were about 1630 ink-jet printers operating in China by the end of Sep. 2013.**
- **Market shares of major domestic and foreign brands (by Sep. 2013).**

Domestic						
Brand	Hope	Meijia	Teckwin	Flora	NKT	
Market share (%)	45	23.5	12	6	4.5	
Amount (set)	734	384	196	98	74	
Foreign						
Brand	Efi-Cretaprint	SITI B&T	KERAjet	System	Sacmi	Durst
Market share (%)	3	2.6	1.5	0.4	0.3	0.2
Amount (set)	49	43	25	7	5	4

Domestic brands dominate the printer market with a share of more than 90%, while the foreign brands account for less than 10%.

Market shares of domestic and foreign ink-jet printers (by Sep, 2013)



- **Gradual R&D improvement of domestic equipment.**

Kingtao third-fired ink-jet printer.

T5 HD ink-jet printers provide 8 colour channels with a maximum length of 1300 mm and a width of 1320 mm. The printer can print directly on rugged surfaces.

The central management system of the R&D equipment provides digital solutions for three periods: before, during and after printing. It solves problems such as slow producing, low precision, difficult colour moderation of the design draft, misfit of rugged texture and patterns and colour deviation. Its powerful digit recording function can collect all data of producing management and operation to facilitate real time supervision of production and optimal upgrading.

Flora 8-colour digital ink-jet and glazing printers.

This is the first ink-jet printer in China that can inject glaze.

It can glaze tile using the printheads of Konica Minolta, Toshiba and FUJIFILM Dimatix.

Digital glazing and ink-jet printing can be achieved at the same time. Glaze can be put in any slot according to real demand.

The third generation of Flora, the 6-colour ink-jet printer can do the same after software upgrading.

Meijia laser printing technology.

This is a technology using laser scanning to form charge shade on cartridge to absorb pigment, and then trans-print the pigment to the ceramics.

Compared with traditional screen print, it triumphs in highly precise images and colours, providing direct printing without platemaking and one time printing.

What's more, domestic ink-jet printer brands like Hope, Meijia, Techwin, Flora, NKT and Kingtao have accounted for about 90% of the Indian market.

B. INK

- **Application of ink in China.**

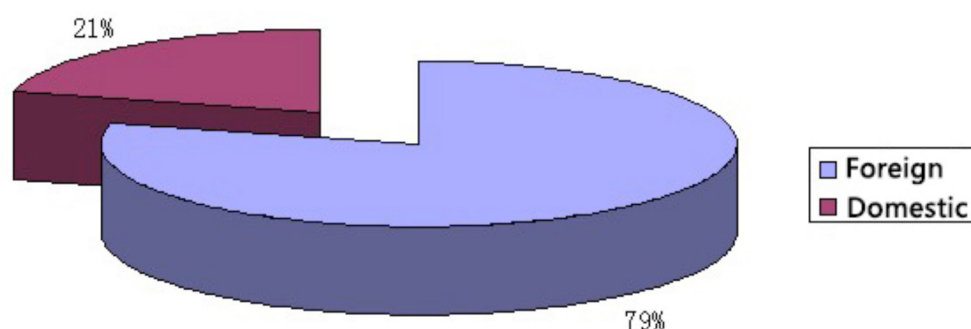
Products	Rustic tile	Microlite (incl. polished crystal tiles)	External tiles	Polished glaze	Third-fired tiles	Ceramic chip
Ink usage (g/m ²)	12-18	12-18	12-18	8-12	5-6	3-5

Rustic tiles, microlites and external wall tiles consume the largest amount of ink, 12-18 g/m².

- Market share of major domestic and foreign brands (by Sep. 2013).**

Foreign						
Brand	Esmalglass - Itaca	Torrecid	Ferro	Colorobbia	Zschimmer & Schwarz	
Share (%)	45	20	3.5	3	2	
Number (set)	734	326	57	49	33	
Domestic						
Brand	Dowstone	Mindst	Create-Tide	Huilong	Marix	Wangxin
Share (%)	10	4.2	2.5	1.8	0.6	0.2
Number (set)	163	69	41	30	10	4

Market share of domestic and foreign ink (by Sep, 2013)



Esmalglass-Itaca accounts for the biggest share of 45% among the foreign brands, and Dowstone accounts for the biggest share of 10% among domestic brands.

It deserves to be noted that domestic brands have taken up 20% of the ink market now.

- Domestic ink vs. foreign ink.**

By the end of September 2013, the price of foreign ink is 130000-160000 yuan/ton, while domestic ink costs 120000-130000 yuan/ton.

Time point	By Sep. 2009	By Sep. 2010	By Sep. 2011	By Sep. 2012	By Sep. 2013
Average price (10000 yuan/ton)	52	42	30	21	13

Price trend of foreign ink.



Since the birth of domestic ink in 2011, the average price of foreign ink has gone through a downward trend; with the huge breakthrough of domestic ink in 2012, foreign ink decreased by 38% from 210000 yuan/ton to 130000 yuan/ton by the end of Sep. 2013.

- **Foreign brands struggle hard for the Chinese market.**

1. Promoting new materials. During the Guangzhou ceramic industry exhibition in May 2013, Colorobbia displayed regular ink C-Ink and C-Shine with special optic effect; Esmalglass-Itaca, Megacolor and Fritta promoted ink with sinking effect; Torrecid staged with HD glaze inject D.G.-CID, T.M.-CID of large amount of glaze, SMART-CID for baking tiles and DECAL-CID for daily used ceramic surface; Ferro focused on the 2.0 version of keramINKs ink.
2. Strengthening power in production. Zschimmer&Schwarz set up an ink manufacturing base in China at the end of July 2013. The ink is developed independently in China and a Chinese team was sent to the ink R&D centre in Europe for study and training. At the beginning of ink development, many overseas engineers came to give instructions to make sure the output synchronized with that of European production bases; Colorobbia develops ink at its glaze base in Kunshan, Jiangsu at the end of 2013, and its pigments are to be imported from Spain.
3. Enhancing sales comprehensively. Colorobbia, Zschimmer&Schwarz, Megacolor and Fritta package ink, glaze, frit and dry parcels to ceramic enterprises and provide professional advice for adding values to tiles by combining ink and glaze.

C. NOZZLES

- Well known models of ceramic nozzles in China.**

Brand	Xaar	FUJIFILM Dimaix				Konica Minolta	Toshiba		SPT
Model	Xaar 1001 GS6/					KM 1024i MHE/			SPT 508GS
	Xaar 1001 GS12	SG1024	PQ512	QS256	QE256	KM 1024i LHE	CF1ou	CF1L	

- Online Application of nozzles of ink-jet printers in China.**

Domestic						
Brand	Hope	Meijia	Techwin	NKT	Flora	Kingtao
Model	Xaar 1001 GS6/	Xaar 1001 GS6/	SG1024/	Xaar 1001 GS6/	SG1024/	SPT 508GS
	Xaar 1001 GS12	Xaar 1001 GS12	PQ512	Xaar 1001 GS12	PQ512/ KM 1024i MHE/ KM 1024i LHE	

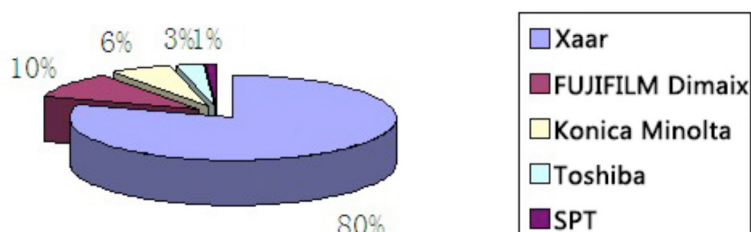
Foreign						
Brand	efi-Cretaprint	SITI-B&T	Kerajet	System	Sacmi	Durst
Model	Xaar 1001 GS6/		Xaar 1001 GS6/		Xaar 1001 GS6/	QS256/
	Xaar 1001 GS12/ CF1ou/ CF1L	SG1024	Xaar 1001 GS12/ SG1024	SG1024	Xaar 1001 GS12	QE256

Xaar 1001 accounts for the majority market among all online ink-jet printers in China.

- **Market share of major ink-jet printer nozzles in China (by the end of Sep. 2013).**

Brand	Xaar	FUJIFILM Dimaix	Konica Minolta	Toshiba	SPT
Market share (%)	80	10	6	3	1

Market share of major ink-jet printer nozzles in China (by Sep 2013)



Xaar ceramic nozzles account for 80% of the market.

3. CONSTANT ACCELERATION OF CHINA'S INK-JET INDUSTRY

A. INK-JET PRINTERS

- **Constant upgrading of R&D technology.**

The function of traditional equipment is improving with higher stability and convenience.

With the progress of ceramic nozzles, ink-jet colour penetration, glaze jet and dry powder jet can be applied widely in two years and laser printing would be of primary use.

- **The final market capacity for ink-jet printers would be 3000 sets.**

Based on the current 3300 production lines, assuming one third of it for ceramic chips and glazed tiles with 3 printers each line, the market demand would be around 3000.

- **The final market value of ink-jet printers would be 9 billion RMB.**

With 3000 sets of capacity, based on the price of 1.3-3 million yuan/set, the market value of ink-jet printers in China would be 3.9-9 billion RMB.

B. INK

- **Various materials for jet ink.**

In the future, ink in China would come from more materials, such as regular ceramic glaze, ink with sinking effect, ink with metal effect, ink with gold and silver imitation effect, ink with pearl effect, penetrating ink with vitrified tiles, frit dry powder or glaze.

- **The final market value of ink-jet in China would be 4.6 billion RMB/year.**

Based on the 3000 set capacity, the average price of ink is 130000 yuan/ton, and ink consumption of each printer is 8-12 ton/year, so the future market value would be 3.12-4.68 billion RMB/year.

- **The price of ink plunged through 100000 yuan/ton.**

In 3 years, with the shocking impact on foreign brands by a nation-wide production of ink and the setting up of Chinese factories by foreign brands, the price would witness a sharp fall. In fact, not so many inks sell at the price of 100000 yuan/ton now already.

It may be noted that new products need to obtain high profits by high prices because of the high R&D cost and outlay in equipment. With the increasing fierce competition, the price would not touch the bottom and the profit would remain at a reasonable level. The prices of ink of different colours would not be the same according to market demands.

C. NOZZLES

- **Constant upgrading of ceramic nozzle technology.**

In the future, to conform to different ink, glaze and powder jet, nozzles would improve and the diameter and structure of the nozzles would adjust accordingly.

- **The final market value of ceramic nozzles in China would be 6.4 billion RMB.**

The cost of ceramic nozzles accounts for that of the printer. Based on a 3000 set capacity, an average nozzle price of 18000 yuan, and 48-120 nozzles for each set, the market value in China would be 2.592-6.48 billion yuan, which is huge. It does not include the amount for replacement.