

2<sup>nd</sup> March 2018

Stock Price: ¥8,110

Market Cap: ¥90.7bn

## RS Technologies (3445) - Chinese ambition: NEW Positive

**RS Technologies is successfully positioning itself to benefit from both reclaimed wafer price increases & Chinese semiconductor market expansion.**

- **RS Technologies, the global #1 producer of reclaimed silicon wafers, achieved above plan FY 12/17 earnings despite 2 upward revisions. Its original estimates had assumed flat reclaimed wafer prices & no SPE contribution, both of which proved conservative.**
- **FY 12/18 estimates again assume no wafer price rises & zero SPE contribution. With reclaimed wafer prices increasing at +10%YoY, & a significant earnings contribution expected from new Chinese JV BGRS, we contend its estimates remain too low.**
- **The acquisition of Rasa Industries' Sanbongi site for ¥400m, after Rasa had previously invested ¥10-20bn, has allowed RS Technologies to operate & expand with minimal depreciation. We also note of 4 fabs available only 2 are in operation, indicating further expansion at relatively low cost remains an option.**
- **Tight prime wafer supply/demand in FY 12/17 not only created shortages within test & reclaimed wafers, with accompanying wafer price increases, but also forced customers to turn to wafer reclamation amid insufficient quantities of new wafers. We expect the robust market environment to continue in the medium term.**
- **Via new JV BGRS, RS Technologies is partnering with a Chinese state-owned silicon wafer producer to manufacture 200mm prime wafers for the Chinese market. It represents a substantial growth opportunity, including prospects for capacity expansion & government subsidies, that is set to become increasingly apparent.**
- **Taking the above points in context of President Ho's savvy management & extensive network in China & Japan, we believe RS Technologies is in a strong position to continue to capitalise on wafer supply/demand constraints & China's ambition to become a major semiconductor operator.**
- **On 24x 12/19 earnings, ahead of a prospective 2 year OP CAGR of +37.3%, we conclude the stock is significantly undervalued & initiate with a Positive rating.**

(JPY Millions)	Sales	YoY	OP	YoY	OPM	NP	YoY	EPS	P/E (x)
12/17 original CoE	8,556	-3.3%	1,939	24.5%	22.7%	1,177	35.4%	108.3	74.9
12/17 1st revised CoE	9,450	6.8%	2,550	63.8%	27.0%	1,630	87.6%	147.6	54.9
12/17 2nd revised CoE	10,750	21.5%	3,000	92.7%	27.9%	1,950	124.4%	175.9	46.1
12/17 Results	10,988	24.2%	3,075	97.5%	28.0%	2,210	154.3%	199.4	40.7
1H 12/18 CoE	10,043	102.0%	1,763	25.6%	17.6%	1,106	3.5%	n/a	n/a
12/18 CoE	20,993	91.1%	3,891	26.5%	18.5%	2,585	17.0%	231.4	35.0
12/18 Storm Est	23,900	117.5%	5,000	62.6%	20.9%	3,320	50.2%	296.8	27.3
12/19 Storm Est	26,500	10.9%	5,800	16.0%	21.9%	3,851	16.0%	344.3	23.6

\* Revised on 3rd August 2017.

\*\* Revised on 19th January 2018.

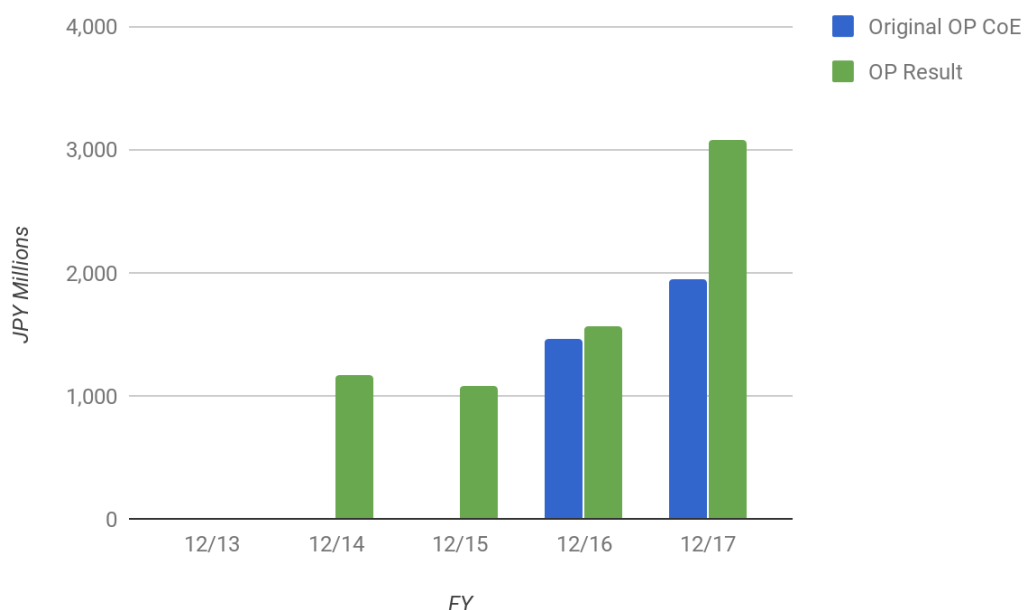
**\* FINANCIAL METRICS:**

P/B	Equity Ratio	Net debt/Equity	RoE	RoIC	WACC	Dividend	YoY*	Yield	Cash Generation**
15.6x	46.4%	14.4%	47.4%	20.0%	7.4%	Y5	0.0%	0.06%	89.3%

\* FY 12/17 included a Y2.5 memorial dividend.

\*\* FY 12/17 operating cash flow / OP.

**\* RESULTS VERSUS FORECAST HISTORY:**



**\* COMPANY OUTLINE:**

- **Background:** RS Technologies originated as a division of Rasa Industries (4022). In 1984 Rasa became **the first company in Japan & the second globally to operate a silicon wafer reclamation service**. Following the Lehman shock Rasa decided to terminate the wafer reclamation business in favour of concentrating on its core chemicals division, but due to employment & local economy protections was forced to find a reclamation business successor.

RS Technologies' CEO Nagayoshi Ho acquired the business, facilities & equipment in December 2010. Over the following years he worked to improve the company's profitability & expand sales volumes by diversifying the customer base (details below). The company listed on the Mothers index in March 2015 & moved to the TSE 1st section in September 2016.

- **Wafer reclamation:** When processing chips, manufacturers use test or 'monitor' wafers before producing the final product on new or 'prime' wafers. On average approx 20 monitor wafers are required for every 100 prime wafers used. RS Technologies reclaims the used monitor wafers & cleans them to be used again.

**\* EARNINGS:**

- **FY 12/17:** RS Technologies originally forecast Y8.6bn -3.3%YoY sales & Y1.9bn +24.5%YoY OP in FY 12/17. **The company revised up its estimates twice:** to Y9.5bn +6.8%YoY sales & Y2.6bn +63.8%YoY OP on 3rd August 2017; & to Y10.8bn +21.5%YoY sales & Y3bn +92.7%YoY OP on 19th January 2018. Actual FY 12/17 earnings were above plan at Y11bn +24.2%YoY sales & Y3.1bn +97.5%YoY OP.

The company's original earnings estimates were highly conservative as initial forecasts assumed zero sales in the semiconductor equipment business, due to the lumpiness of sales & lack of visibility regarding timing, as well as flat

prices YoY in reclaimed wafers. In contrast the company recorded Y1.4bn equipment sales & Y130m OP, whilst **tight supply/demand resulted in reclaimed wafer prices increasing approx +5%YoY**.

We also note **both company fabs operated at above 100% capacity in FY 12/17** (details below), with 3D NAND related demand proving particularly positive for earnings. 3D NAND production requires approx 50 test wafers for every 100 prime wafers, versus the average ratio of 20:100. Monitor wafer requirements for leading edge 10nm & 7nm processes are also relatively high, in particular at TSMC.

- *FY 12/18*: RS Technologies forecasts Y21bn +91.1%YoY sales & Y3.9bn +26.5%YoY OP in FY 12/18, but its growth outlook is primarily based on an anticipated earnings contribution from new JV BGRS (Beijing GRINM RS Semiconductor Materials). The company continues to assume zero equipment sales & no wafer price rises, despite reclaimed wafer prices rising at a rate of approx +10%YoY in the FYTD. **We therefore believe RS Technologies is likely to comfortably exceed its CoE in FY 12/18** & forecast OP of Y5bn +62.6%YoY versus the CoE of Y3.9bn +26.5%YoY.

- *Medium term*:

- *Company targets*: In 2016 RS Technologies disclosed MTP estimates based on similarly conservative assumptions. As well as the original FY 12/17 CoE of Y8.6bn -3.3%YoY sales & Y1.9bn +24.5%YoY OP, RS Technologies forecast Y8.9bn +3.9%YoY sales & Y2.1bn +10.7%YoY OP in FY 12/18. It also targeted Y9.2bn +3.5%YoY sales & Y2.4bn +13.3%YoY OP in FY 12/19.

Given actual FY 12/17 earnings outstripped the original CoE, **we believe FY 12/18 & FY 12/19 estimates are no longer relevant guidelines**. We plan to monitor company news for updated medium term goals.

As well as growth in the core reclamation business, we anticipate **significant earnings from the new prime wafer manufacturing Chinese JV**. We concede that as prime wafers are lower margin than reclaimed wafers, the JV is likely to be negative for the sales mix, resulting in the overall OPM declining from 28% in FY 12/17 to approx. 20%. We also anticipate one-off costs in FY 12/19 associated with the consolidation of local production bases. Despite both factors we believe the potential sales volumes involved imply a sizeable OP contribution over the medium term.

#### \* MARKET ENVIRONMENT:

- *Competition*: RS Technologies is the #1 ranked operator in the silicon wafer reclamation market with a 30% share in a market with 10 major operators. #2 is Mimasu Semiconductor (8155, 38.69% owned by Shin-Etsu Chemical (4063)), which processes prime as well as reclaimed wafers. Hamada Heavy Industries, which mainly produces blast furnaces, scrap recycling & industrial machinery but also processes reclaimed wafers, is another domestic competitor.

We note Japanese wafer reclamation companies benefit from the over 50% combined share of the global prime wafer market held by domestic operators Shin-Etsu & SUMCO (3436, Positive).

The three major Taiwanese operators, Kinik, Scientech & Phoenix Silicon International, hold a combined 30% share of the global market. Companies with a Taiwanese presence, including RS Technologies' Tainan fab, **benefit from proximity to major customer TSMC**. TSMC uses approx 33% of the global reclaimed wafer supply & therefore accounts for 20-30% of RS Technologies' sales.

RS Technologies aims to **increase its market share to 40%** in the medium to long term, primarily via M&A & tie-ups in combination with planned capacity expansions at its Sanbongi & Tainan factories.

- *USPs*:

- *Reclamation focus*: Of the 10 major operators RS Technologies believes its silicon wafer reclamation business comprises the largest percentage of company sales. Competitors typically operate a reclamation division as a 2nd or 3rd segment, as opposed to a core business, with RS Technologies therefore regarding its accumulated knowledge & industry focus as USPs.

- *Rasa facilities*: The company also benefits from use of equipment acquired from Rasa Industries. Rasa invested approx Y10-20bn into its Sanbongi facility, which **RS Technologies was able to acquire for just Y400m**. It has therefore been able to establish itself & expand with a substantially lower depreciation burden compared to other operators.

**Of the four factory buildings within the Sanbongi site, just two are in operation.** The remaining two have been left empty as 'blank fabs', containing clean room spaces but no equipment. Within the industry adding 100,000 monthly reclaimed wafer capacity via a new building & equipment can cost approx Y10bn, making expansion frequently unprofitable for competitors. In contrast RS Technologies can implement a similar expansion into existing buildings for the **Y4bn cost of equipment**.

\* **CUSTOMERS**: RS Technologies supplies reclaimed monitor wafers (below) to over 40 front end process manufacturers. As of FY 12/16 **the company's #1 customer was TSMC**, followed by #2 Toshiba (6502) & #3 Sony (6758). Other operators supplied by RS Technologies include Intel, IBM, SMIC, UMC, Nanya Technology, GlobalFoundries & Samsung. By recycling & re-using test wafers the manufacturers are able to reduce process costs.

When the business was under Rasa Industries' ownership, the company primarily supplied Toshiba & had zero transactions with multiple major operators including TSMC. As part of improvements implemented following the Rasa Industries buyout, RS Technologies focused on global customer diversification with the goals of improving stability & expanding sales volumes.

\* **WAFER BUSINESS:**

(JPY Millions)	12/17 Results	YoY
Sales	9,513	33.2%
OP	3,461	101.5%
OPM	36.4%	12.3%

- *Wafer prices*: Assuming a 300mm prime wafer is priced at approx \$100, a monitor wafer would be priced at approx \$50 & a reclaimed wafer at \$20. The prices of reclaimed wafers are rising with prime wafer prices, but at a slower pace. Prime wafer prices are currently increasing at approx +20%YoY, whereas reclaimed wafer prices are increasing at approx +10%YoY.

There are two main factors driving reclaimed wafer price rises. Firstly, as shortages become apparent within prime wafer supply, monitor wafer production capacity is reduced & fewer wafers are available for reclamation. We concur with the RS Technologies view that **major prime wafer manufacturers are reluctant to raise capacity** despite high demand & do not expect the situation to change in the medium term. (For further details on our view of the prime wafer market, please see our 15th December 2017 report on SUMCO (3436, Positive), '*Manifestly underestimated*').

Secondly, whilst certain companies are hesitant to send etched monitor wafers for reclamation due to a perceived risk of technology theft, manufacturers are **increasingly forced to use reclaimed wafers as new monitor wafer supply dries up**. The shift is becoming increasingly apparent among RS Technologies' major Korean customers.

- *China*: RS Technologies expects prime wafer prices to remain robust in China in the medium term. It believes there is a risk of local low end prime wafer prices being cut in the longer term as it & other companies consider global expansion, due to a likely inability to compete with Shin-Etsu & SUMCO technologically. In the event of expansion outside of China, RS Technologies is likely to leverage existing relationships with global manufacturers to establish its business.

Given the early stages of business at both RS Technologies & emerging Chinese wafer manufacturers, combined with our outlook for substantial demand growth in China over the next 3-5 years, we believe **local operators are unlikely to target exports or price cuts in the medium term**. We note China's first 300mm wafer manufacturer, Zing Semiconductor, is targeting production capacity of 600,000 wafers per month but is estimated to sell just 5,000 per month at present due to its low technological capabilities. We plan to closely monitor the Chinese wafer manufacturing industry as it develops, but do not perceive an imminent risk of price competition.

- *Wafer margins:* Despite lower sales prices, reclaimed wafers have higher margins than prime wafers because they use customer waste wafers as a raw material rather than silicon. The disparity enabled RS Technologies to record a GPM of 39.6% at FY 12/17 results versus 26.1% at SUMCO.

RS Technologies' Taiwanese fab incurs lower personnel & electricity costs than Shin-Etsu & SUMCO's exclusively Japanese production bases. The company expects Chinese plant costs to be similarly low & for subsidies to improve JV profitability. We also note RS Technologies continues to use the Sanbongi facilities & equipment acquired at low cost from Rasa Industries, including equipment which was transferred from Japan to Taiwan.

- *Technologies:*

- *Chemical film removal:* RS Technologies utilises a proprietary chemical process for stripping thin films from wafers, which involves less damage to the wafer surface than competing polishing-focused cleaning methods. The chemically cleaned wafers can therefore be used & reclaimed a greater number of times, resulting in cost savings for the manufacturers.

- *Metal removal:* The company also possesses a **unique metal removal technology**, which is primarily used for removing copper circuit components from wafers which would otherwise be disposed of. As wafer reclamation is used for cost cutting, customers have historically been reluctant to spend on copper removal in addition to basic cleaning, but are increasingly adopting the technology. Until recently just two customers used RS Technologies' copper removal service, but as of FY 12/18 a third major customer has approved the process.

As copper removal increases the quantity of reclaimable wafers, RS Technologies estimates its new customer contract has the long term potential to add **up to 200,000 wafers per month** in demand. The company is considering a future capacity increase to accommodate growth, but the option remains under investigation. RS Technologies is also in the process of targeting business from a fourth operator, which if successful has additional positive implications for long term earnings.

- *Other businesses:* RS Technologies also records earnings from a solar power plant at Sanbongi; its business as the overseas agent for Hitachi's (6501) ultrasonic imaging systems; & its business as the Chinese agent for Nippon Muki's chemical filters. The three businesses comprise a combined 3% of sales & are not expected to grow significantly.

**\* BUYING & SELLING OF SEMICONDUCTOR PRODUCTION EQUIPMENT:**

(JPY Millions)	12/17 Results	YoY
Sales	1,380	-14.4%
OP	130	-41.4%
OPM	9.4%	-4.4%

As well as operating silicon wafer reclamation & production, RS Technologies buys, sells & provides transport & installation for used semiconductor equipment.

The company began to disclose business earnings as a separate segment in FY 12/15, at which point the division produced just Y156m external sales & Y135m OP. In FY 12/16 it generated Y1.6bn sales & Y221m OP, followed by Y1.4bn sales & Y130m OP in FY 12/17. We therefore believe the company's assumption of zero earnings contribution in FY 12/18 to be extremely conservative & have assumed flat divisional earnings YoY within our estimates.

**\* PRODUCTION:** RS Technologies has two silicon wafer reclamation sites: the Sanbongi Factory in Miyagi, Japan & the Tainan Factory in Taiwan. Both sites are operating at above 100% utilisation, thus on 28th December 2017 the company announced a Y1.1bn investment into expanding 300mm wafer reclamation capacity. It plans to add 50,000 wafers per month for a total 300mm output of 400,000 wafers, to be funded via RS Technologies' held cash.

- *Sanbongi:* The Sanbongi Factory consists of four buildings: Fabs 5, 6, 7 & 8. Fab 5 handles 125, 150mm & 200mm wafer processing, whilst Fab 8 handles 300mm & 450mm wafer processing. Fabs 6 & 7 are closed & have been left empty.

RS Technologies acquired the Sanbongi Factory from Rasa Industries within the December 2010 takeover. Site output levels were initially volatile, as the March 2011 Tohoku earthquake halted production for 6 months, but the plant has since gradually ramped up to over 100% utilisation. RS Technologies also took advantage of government subsidies, made available under Abenomics policies, for renewing one of the fabs.

The Sanbongi Factory has an official production capacity of 120,000 wafers per month sized 200mm or below, & 200,000 300mm wafers per month, but **amid high demand it has modified its processes to enable 230,000 300mm wafers per month.**

As part of the Y1.1bn expansion RS Technologies plans to spend Y400m adding 20,000 wafers per month of capacity at Sanbongi. New capacity is scheduled to come online in 1H 12/19, at which point Sanbongi will have a total of 250,000 monthly 300mm wafer capacity.

- *Tainan*: In 2014 RS Technologies decided to establish a production site in Taiwan primarily for supplying reclaimed 300mm wafers to TSMC & UMC. It spent Y2.5bn purchasing the used Tainan factory site, a clean room & equipment.

The factory began 300mm reclamation in December 2015 & gradually ramped up capacity over CY 2016. It has official production capacity of 100,000 reclaimed 300mm wafers per month, but has similarly made adjustments to raise production limits to 120,000 wafers. RS Technologies plans to spend Y700m in Taiwan adding 30,000 wafers in monthly capacity to bring total output to 150,000 wafers per month. The new Taiwanese production is also due to come online in the 1H 12/19.

**\* M&A:**

- *BGRS creation*: On 1st December 2017 RS Technologies announced its intention to move into prime wafer manufacturing in China via JV BGRS (Beijing GRINM RS Semiconductor Materials).

Previously local state-owned enterprise GRINM (General Research Institute for Nonferrous Metals) owned 100% of ingot & wafer manufacturing subsidiary GRITEK. GRITEK is to be transferred entirely to the control of BGRS, of which RS Technologies owns 45%, GRINM 49% & investment business Fujian Kuramoto 6%.

RS Technologies plans to invest USD62m to purchase its stake, which is to be funded via bank loans, whilst Fujian Kuramoto is investing USD8m. 60% of RS Technologies' \$62m is to be provided upfront, with 25% in the following year & 15% in the year after. Funds raised are to be dedicated primarily to production expansion.

- *Ownership*: As both GRINM & Fujian Kuramoto are local companies, the business is majority Chinese owned. **GRINM's status as a state enterprise is allowing the JV to secure substantial subsidies from the national government.**

Conversely as Fujian Kuramoto is operated by a relative of RS Technologies' President Ho, RS Technologies has majority control over management decisions. It has also been agreed that despite its 45% stake, the company will be able to record earnings under consolidated results.

- *Competition*: We believe RS Technologies' Chinese market entry shares similarities with **Ferrotec's (6890, Positive)** decision to partner with GlobalWafers (Taiwan) & secure subsidies from the local government of Hangzhou to establish a total 450,000 wafers per month of 200mm capacity by FY 3/21. (For further details, please see our 30th November 2017 report on Ferrotec, 'Extreme tightness'.)

RS Technologies believes it is in a superior position to Ferrotec due to its ability to secure national rather than local government subsidies, with no need for equity financing. It therefore does not regard Ferrotec as a key rival, in comparison to local operators JRH QL Electronics & Wafer Works (Taiwan).

- *Growth opportunity*: Under the 'Made in China 2025' policy the Chinese government aims to increase internal production of IC components from 10-20% in 2015 to 40% in 2020 & 70% by 2025. **RS Technologies therefore shares the Ferrotec view that China's semiconductor industry is set to undergo rapid subsidy driven expansion**, similar to the prior expansion of the Chinese LCD industry.

RS Technologies also believes SUMCO & Shin-Etsu Chem prefer to supply non-Chinese customers where possible, due to the reduced risk of technology theft & greater requirements for the companies' high end 300mm wafers. The company therefore anticipates a significant opportunity in prime wafer supply as Chinese operators such as SMIC & XMC increasingly procure wafers locally. We regard the company's outlook as logical & also expect it to benefit (similar to Ferrotec) from 200mm wafer price increases.

- **Production:** The GRITEK Beijing factory has been in operation for 30 years & operates in the black. It produces 50,000 125mm wafers per month, 150,000 150mm wafers per month & 50,000 200mm wafers per month, to bring total monthly production capacity to 250,000 wafers per month.

The company plans to raise 200mm capacity by 4x current levels to 200,000 wafers by the end of FY 12/20. It targets capacity of 350,000 200mm wafers per month, or 7x current levels, by the end of FY 12/22. As well as funds procured from the JV creation, capacity expansion is to be funded by government subsidies which we believe **have the potential to exceed the amount invested by RS Technologies.**

- **Earnings:** The JV is set to contribute to RS Technologies' earnings from FY 12/18, when it estimates Y9.1bn sales & Y1.3bn OP from the new business. The company anticipates JV sales to decline to Y8.9bn -1.5%YoY & OP to Y640m -50%YoY in FY 12/19, due to one-off costs & the disruption of consolidating production bases, but **subsequently to rebound to Y12.3bn +38%YoY sales & Y1.1bn +73.4%YoY OP in FY 12/20.** Thereafter the company forecasts rapid growth to Y23.4bn sales & Y5.7bn OP in FY 12/23.

\* **FX:** RS Technologies is assuming an average FX rate of Y/\$105 in FY 12/18. A Y/\$1 depreciation contributes Y50m to OP.

\* **MANAGEMENT:** RS Technologies was founded by President Nagayoshi Ho (also known as Fang Yongyi, when referring to the Chinese reading of his name). President Ho was born in Fujian & continued to live in China until completing high school, after which he attended university in Japan & chose to establish a Japanese company.

**President Ho's primary strength is his extensive network of relationships spanning both China & Japan,** as well as other connections globally. His connections with politicians have facilitated the company's ability to apply successfully for subsidies, particularly in China.

\* **SHAREHOLDER RETURNS:** RS Technologies plans to pay a flat dividend YoY (excluding a Y5 commemorative payment in FY 12/17) of Y5 in FY 12/18, on a payout ratio of 1.2%. The company concedes its dividend payout ratio is overly low, thus aims to gradually raise it to the domestic average of 20% over 3-4 years. Due to its ability to gain subsidies, it does not anticipate a need for equity finance to fund its capex plans.

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