**Market data**

EPIC/TKR	SCE
Price (p)	16
12m High (p)	28
12m Low (p)	15
Shares (m) (incl. new shares)	113
Mkt Cap (£m)	18
EV (£m)	16
Free Float*	86%
Market	AIM

*As defined by AIM Rule 26

Description

Surface Transforms is 100% focused on manufacture and sales of carbon ceramic brake discs. It has recently expanded its manufacturing capacity.

Company information

Non-Exec Chair.	David Bundred
CEO	Dr Kevin Johnson
Finance Manager	David Allen
	+44 (0) 151 356 2141
	www.surfacetransforms.com

Key shareholders (current equity)

Directors	15.1%
(13.8% of enlarged share capital)	
Hargreave Hale	15.8%
Richard Gledhill (director)	13.1%
Unicorn Asset Mgt	10.4%
Barclays Wealth	3.8%
Hargreaves Lansdown	3.1%

Next event

October-17	Final results
November-17	AGM
February-18	Interim results

Analyst

Mike Foster	020 7194 7633
	mf@hardmanandco.com

Surface Transforms

Riding the carbon ceramic brake revolution

Surface Transforms manufactures and sells carbon ceramic brake discs. These discs offer major weight-saving and safety advances. We are in the early stages of dramatic demand growth. The company is the only alternative to the current near-monopoly supplier, which is substantially owned by the family behind BMW. It is progressing with development for six auto OEMs' potential new models, in volume contracts. Its new factory provides easily scalable supply. With proven expertise, test successes and years of low-level 'pre-production' sales, the business is at a major inflection point.

This document initiates our coverage.

- **Strategy:** Surface Transforms' carbon ceramics brake discs capability is the result of extensive R&D (typically c. 80% sales) and optimisation of the production process. The payoff from the latter comes this year, with the move to the new, much larger, modern factory and the optimisation of equipment. This brings sales capacity of £17m in 2018, and there are plans with customers to more than fill this over the subsequent three years.
- **Market potential:** A potential £2bn OEM market, is supplied by a monopoly competitor with sales just over £100m. Customers want Surface Transforms to succeed, so as to provide additional capacity and a second source supply. As the cost of production falls the market scope will widen dramatically.
- **Cash:** In order to maintain momentum and avoid cash concerns over potential, but not certain, customer programme delays, the company successfully in July raised £3.0m through a Placing, Subscription and seeks £0.5m via an open offer.
- **Recent trading:** Sales for the FY17E year were lower than had been expected earlier in the year, as capacity (limited during the move) was switched from revenue generating production to prototypes. These sales are within the total of firm orders and customer commitments in place at end May 2017, which total over £850k, the highest visibility of future sales the company has ever had.
- **Risks:** Investment comes ahead of firm orders. The company has limited control over the timeline of auto OEMs new models. The move to a larger modern factory has been a success, the importance of which would be difficult to overstate. Note the Open Offer of £0.5m is included in forward cash estimates.

Financial summary and valuation

Year end May (£m)	2017E	2018E	2019E	2020E	2021E	2022E
Sales	0.70	1.50	2.90	7.50	10.90	16.00
Gross profits	0.45	1.00	2.12	5.00	6.90	10.04
EBITDA	(2.30)	(1.60)	(0.65)	1.25	2.10	5.30
EBITA	(2.45)	(1.90)	(1.10)	0.75	1.60	4.70
PBT	(2.45)	(1.90)	(1.10)	0.75	1.60	4.70
PAT	(2.10)	(1.40)	(0.75)	1.10	2.00	5.10
EPS (Adj) (p)	(2.33)	(1.28)	(0.66)	0.98	1.77	4.52
Shareholder funds	3.95	5.85	5.10	6.20	8.20	13.30
Net (debt)/cash	1.53	1.83	0.73	2.13	3.93	8.40
P/E (x)	loss	loss	loss	16.41	9.02	3.54
EV/sales (x)	18.39	10.41	5.97	2.12	1.30	0.60
EV/EBITDA (x)	loss	loss	loss	12.73	6.72	1.81

FY16 sales £1.4m, EBITDA -£1.15m. No dividends are projected. Source: Hardman & Co Research

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Executive summary

Obsessional focus on commercialising its product, pegging pre-production advances with production (factory) advances

In advanced discussions with six auto OEMs

Growing demand

Clear driver to product up-take

Design-in, not optional extra – hence quantifiable revenue once contract is agreed

Production requirements have all been overcome, with the new factory (and new major equipment) being a game changer

Multiple entry points to a market now opened up for quantum growth

Surface Transforms' focus is rigorous: supplying carbon ceramic brake discs, a market set to grow substantially. It requires extensive – obsessional – expertise to manufacture. It is thus on the right side of significant barriers to entry, with a new factory up and running. After a long track record of small scale production, it has reached the point where six auto OEMs are in advanced discussion about sales of a much larger magnitude. The market is set to grow ten-fold and more from its current £100m as carbon ceramic brake adoption accelerates. Customers in this market seek a dual source and extra capacity. Surface Transforms' new factory is itself thus a major catalyst to effective demand. This is a proven road-tested product, with current revenue from auto racing retrofit and aero OEM.

- ▶ The market will grow, because they are an attractive option on luxury, fast cars and emission targets will also push OEMs to lower chassis weight. Carbon ceramic brakes can save circa 100kg on a chassis.
- ▶ Surface Transforms now faces a 'target-rich' environment. Several (or all) of the six auto OEMs are likely to place substantial orders, as the constraint on the market has been that 99% of this £100m market – as currently sized – is supplied by one manufacturer. For anything other than niche supply, automotive OEMs need the comfort of dual source supply. Surface Transforms has just become that credible second source (with a product we consider superior).
- ▶ Surface Transforms' new factory – which Hardman has visited – has been commissioned after 12 months' work optimising the product and its manufacturing process in the former, smaller factory. It was opened in the early weeks of 2017.
- ▶ The skill has been to progress pre-production tests with six auto OEMs prior to opening the established, scalable manufacturing facility early in 2017. The company is on the cusp of its product being designed-in to its first automotive production model, we believe. OEM design-in gives far greater size and visibility to quantifiable revenue than the current retro-fit to specialist cars. It is important to note that the OEMs will prefer to design-in as opposed to 'optional extra' carbon ceramic brakes in order for the all-important weight savings to be achieved through the whole chassis; on their own four carbon discs save 20Kg of weight vs iron rotors, but the whole chassis' greater saving is the key.

Hand-in-hand: Pre-production client engagement and production capacity growth

Surface Transforms' new factory is a step-change from the former 'proving-ground' which had secured discussions with the six auto OEMs, as well as supply current sales to auto (by retrofit) and aero customers. The product has engineered-in superiority vs competition. It has a lower running temperature once operating (150^o C cooler than the competition – for the same vehicle kinetic energy). This is a significant part of the reason for the lighter weight than the competition. There are also strength improvements in part from the alignment of the original carbon fibres. The crucial point is the step-change vs the main-market (iron) discs, but it can only help that Surface Transforms' product is superior to the other existing carbon ceramic brake manufacturer's.

Surface Transforms

R&D, client pre-production trials, new factory – this is a company on the cusp of securing major contracts

The new production facility is commissioned and working, with further benefits at the start of 2018. Sales contacts with auto OEMs progressed through this whole process, giving them confidence that it would deliver. The new (early 2018) furnace will raise capacity by 17,000+ disc pa vs current 4,000 (auto and aero) capacity. The ‘hand-in-hand’ strategy means, we believe, the company is on the cusp of its product being designed in to its first OEM production model, underlined by increased OEM confidence from the factory move, the enhanced capacity and process (in coming months). The recent weeks represent, therefore, a step-change rise in the visibility of the journey to volume contracts. That said, the earliest likely date for PBT is FY20E.

The customers are – we believe – looking for a credible second supplier....

Target rich

Surface Transforms’ market is ‘target-rich’. Its major capacity expansion, and bringing of processes in-house, comes at a time when the company has six auto OEMs evaluating the product in final-stage performance trials. We believe the constraint on the market has been that 99% of this £100m market – as currently sized – is supplied by a single competitor. Surface Transforms’ factory (opened at start 2017) opens the crucial second source. The credibility is based on its high R&D, focus, years of road tests on retrofit cars and with OEMs in extensive testing. As to market volumes, the demand curve is highly price elastic (i.e. from a sub £100m pa to £2bn+ pa market). Investors will have to understand that the OEM controls the timeline, and delays will not reflect their concern about the quality of the product and the ability to deliver volume. This adds an element of uncertainty. OEM advanced talks are outlined in 20th June RNS.

.... and – with the new factory and track record to date – Surface Transforms now is that supplier

The product is a crucial help to meeting emissions targets

There are clear advantages of carbon ceramics brakes vs iron. The market and Surface Transforms’ position within it are both set to grow significantly. The market will, because emission targets push OEMs to lowered chassis weight. Carbon ceramic brakes save circa 100kg on a chassis – a major amount, typically 5% of an average 2000kg car. This weight saving is, of course, only available if the product is designed-in to the model. A retrofit or an optional extra does not have this advantage.

Substantial growth for Surface Transforms, by taking a share of the explosive market-wide growth

The Directors would be pleased, we understand, with approximately one third of the overall market within some five years. An important point, as we see it, is that the market growth prospects are expansive and so Surface Transforms seeks to take the growth (or a large share of it) and not to directly attack the competitor’s position.

Once specified to a model, volumes should be highly predictable

Visibility of volumes and margins once specified

That, crucially, raises the visibility of volume off-take to Surface Transforms. Initially models will predominantly (not all) be at the luxury end. OEMs deliberately undersupply these models, so, once the discs are specified, the visibility of volume offtake is unusually high for an auto component manufacturer. After years of product testing, the timing is imminent.

The product’s superior performance, the ongoing and significant production cost reductions and the nature of earlier stage automotive components, all give us confidence that gross margins will remain robust. Sales prices will fall as production efficiencies are achieved, gross margins of 60%+ should remain robust.

Successful fund raise

Forward numbers

We refer to the successful fund raise – on which we outline fuller details on page 26 of this document.

One OEM enters development early in 2018 with £7m sales scheduled from first financial year of production, from mid-2019. One auto OEM currently generates

Surface Transforms

We model production model revenue from mid 2019

(modest) development revenues (Tier 2 supplier). Aston Martin's contract is ongoing as are retrofit auto market sales (e.g. track, race cars).

At every level, the Board's focus is to minimise risk – to the actual and potential customers and to the financing of the growth. It communicates regularly at a high level with customers and all six OEM potential clients (one is in pre-production). The financial strategy is to derive revenue from pre-production and testing, to fund the development of process, marketing support and manufacturing.

FY21E EBITDA £3.3m – half of likely sales growth in following year falls straight to bottom line

We estimate PBT in FY20E. FY21E, we estimate £10.9m sales, 30% EBITDA margins, an EBITDA £3.3m. We estimate rapid sales growth continuing and an indicative 50% of sales growth in that following year to fall through to the bottom line.

Surface Transforms' balance sheet of end May 2017 (year-end) held £1.53m net cash.

Significant operational gearing

Our model project estimates to FY22E. This is noteworthy in that we estimate full capacity utilisation of Cell 1 during the whole of that year - £16m revenue. For that year, the incremental costs are estimated as the cost of sales but very little else. With gross margins estimated at 60% plus, and with an estimated rate of maintenance capital expenditure of as low as £0.1m per annum, this drives the strong free cash flow and our profit estimates as outlined on page 1.

Why buy carbon ceramic brake discs?

Material savings in the chassis weight

▶ Weight reduction

Four Surface Transforms brake discs weigh 20kg which is c.40% the weight of four iron brakes. In reality, this is only part of the weight saving achievable since the lighter brake system allows a lighter chassis to be specified. We understand the total savings could be +/- 100kg where the discs are an intrinsic part of the model design. This difference is a large number - 5% of the average 2 tonne car weight. Of course, a retrofit or an optional extra does not have this advantage. The model's design has to be incorporating the whole new system from the start if the full weight gain is to be achieved. Early adopters of carbon ceramic brakes are performance car manufacturers since the 'liveliness' of a car largely depends on its power to weight ratio.

OEM models: designed-in as opposed to retro-fit

▶ Performance

The un-sprung weight of a car (i.e. the wheel and brake) are key to the handling. The lower this weight, the better the driving experience will be. Again, it becomes clear why performance car OEMs have been first to embrace carbon ceramic brakes.

Attractive performance

▶ 4x the lifespan of conventional iron discs

The strength of the product in sustaining very high temperatures means it will typically last four times as long as an iron brake. In practice, for most drivers, it will last the life of the car.

Significant lifespan extension

▶ EU 2020 emissions targets require significant weight savings

Weight saving is likely to be a key part of OEMs strategy to meet new regulatory targets. The need to save weight is as important for electric cars as conventional ones. The weight is principally saved on the chassis more than the carbon ceramic disc, with significant positive implications.

Regulatory incentive: 2020 emissions regime – weight

▶ Brake dust

As carbon ceramics brakes wear much slower than iron ones, they produce virtually no brake dust. This dust eats into the fabric of alloy wheels which nearly every high-end car has, as well as making them look unsightly.

Investment case

Focus on a market set to grow ‘explosively’

Surface Transforms is focused totally on supplying the potential £2bn+ market

Surface Transforms is focused completely on supplying carbon ceramic brake discs, a market set to grow explosively because of the benefits of the product (page 6) and because OEMs desire/require an alternative to the current dominant player, BremboSGL, which is also substantially owned by the Quandt family, the near majority shareholders in BMW.

Six auto OEM pre-production testing well advanced – one contract

Pre-production testing with six OEMs is progressing well – as ever with OEMs and mission-critical component supply, this takes significant time. Surface Transforms’ capability as a new dual source and its ongoing cost reductions kick starts new and significantly higher growth potential in the whole market. By the nature of the models on which the product is likely to be specified, revenue visibility will be high – once the product is designed-in - to achieve anything like its optimal emissions (weight) savings, the product must be designed-in and not an optional extra.

The component supplier has a monopoly for the life of the model...

Typically, OEMs complete the specification of components for a new model two years ahead of launch. Essentially, the component supplier has a monopoly for the life of the model, since the costs of re-engineering and retesting the model is unlikely to justify a change on the OEM’s part. The contract will normally specify price with a discount for scale, but not guarantee volume. However, the OEMs generally undersupply their top end models, (the ones likely to have carbon ceramic brakes) so the production quantity schedules are more reliable at this end of the market.

.... the production quantity schedules are set to prove particularly reliable in this market

However, the timeline of model launches is outside the control of Surface Transforms. We understand that the delays the company has suffered are no reflection of the OEMs view of the product, nor the ability to deliver reliable product. One OEM, though, has specified further testing to ensure that the discs can cope with an issue it identified with other discs.

It is the start-of-production date which may vary

To date, Surface Transforms has been spending £1m+ pa on R&D for many years – around 60-80% of revenue. Indeed, FY17E was a higher quantum, but is expected to revert to c. £1m pa. This is interesting in the context of the market norm of R&D spend on mature automotive businesses estimated to be between 7% and 10% of revenues.

High R&D spend, with significant IP leads to superior products and also into its manufacturing process

Major inflection-point now, with the new factory operational

The new factory (2017) is a major inflection point

Surface Transforms’ new factory provides the confidence to the auto OEMs that they can deliver. This is because it operates on a manufacturing cell structure, allowing easy scalability and repeatable quality assurance – the final pre-requisite for auto OEM production orders. This, together with its high R&D, years of road tests on retrofit cars and extensive testing with OEMs, should now put the company in the ‘final lap’ before being fully specified onto production models.

High visibility to a £7m pa contract start mid 2019

One OEM is set to enter development early 2018 with a scheduled first financial year of production sales of £7m, starting mid 2019. £7m would fill circa half the capacity of manufacturing cell 1. One auto OEM currently generates (modest) development revenues (a Tier 2 supply arrangement). A modest aero OEM contract is ongoing.

With ST’s supply price reductions and scalable production facility, sales growth can be explosive

In the coming couple of years, demand is anticipated to ramp up as per schedules on page 11. Medium term demand is price elastic, to a high degree (i.e. from a sub

£100m pa to £2bn+ pa market). Sales prices will inevitably fall as production efficiencies rise, but the Directors will not compromise gross margins % for volume. Strategically, once dual sourcing is achieved, there is a factor change in the size of the market.

Placing, subscription and open offer at 15.5p

New equity at 15.5p

See 6th July RNS announcements, with details on page 26 of this document. Surface Transforms announced its Placing, Subscription and Open Offer of up to approximately 22,580,806 new Ordinary Shares at a price of 15.5 pence per share to raise gross proceeds for the Company of approximately £3.5 million. On 6th July it was announced that 17,419,500 new shares had been successfully placed at the price of 15.5 pence each. 1,935,500 new shares have been confirmed as subscribed. There is an Open offer to shareholders for up to 3,225,806 new shares.

Cash, profit potential, risk mitigation

Minimal maintenance capex

An estimated £2.9m cash will be needed to fund growth capex over the next two years to end FY19.

Estimated FY22E EBITDA margins of 33% once the capacity is filled

Surface Transforms' balance sheet is supported by cash, but faces cash burn and capital expenditure. Cash spending on capital assets is set to tail off from calendar 2019. The fund raise announcement of 6th July 2017, with raising between £3m and £3.5m provides investors with reassurance that the plan can be financed.

FY20E PBT projection

Taking a conservative view on maintaining strong R&D / overheads and on the timing of full production call-off, we estimate £10.9m sales FY21E, generating EBITDA margins of 19%, with 33% the following year once the capacity (cell 1) is filled – giving an indication of operational gearing. The earliest likely date for PBT is FY20E. Risk mitigation, strategically, is the key – to customers and to investors. Operational and financial risks have been closely monitored and mitigated. Development, testing and optimisation of the process has been extensive and successful. The complexities of certification and production mean that barriers to competition are high.

Auto retrofit of small volume runs and also aero (including the potential expansion to light commercial through the same aero client) mitigate the cash burn – albeit it is clear that current cash outflows from capital spending will result in cash outflows until these tail off in early calendar 2019. No upfront tooling is required, enabling these small runs. We outline the aero contract background later in this document.

The new factory fully commercialises years of IP

The commissioning of the new factory delivers scalability as well as clear visibility on cost/production efficiencies. It has come at expense, but it comprehensively addresses i) order fulfilment risk as seen by the potential customer; ii) smooth and robust delivery of Surface Transforms' expanding production.

This is a high-precision, chemically complex product. The new factory comes after 12 months' build-up, testing and refining of processes. With the new factory up and running and with new specialist equipment set to be operational by January 2018, this improvement in costs, volumes and cycle-times will accelerate.

*...as are reduced production costs.
These are highly visible*

Surface Transforms' programme of ongoing manufacturing cost (and cycle-time) reductions is well in hand. There are a specific number of discrete projects identified to reduce costs by a further 35-40% by start 2018. We understand Surface Transforms will have a target of ongoing reductions beyond that level.

Superior quality – better IP

R&D has developed a product we consider superior to the competition in a number of ways, intrinsic to the product. Two of the most important differentiators are:

*Heat dissipated efficiently along
long, straight fibres*

- ▶ The optimisation of fibre alignment (using long fibres) and consequent heat dissipation and strength (hence weight) benefits. Both benefits can also be combined to offer a smaller disc on a car compared with the competitor.

*Fibres aligned directionally – for
strength of the disc*

- ▶ The process of knitting fibres (as opposed to press), which aligns them directionally, significantly enhancing structural strength.

This is evidence of a significant, innovative development programme, and has been built up through i) the long expertise of the top team (see page 23); ii) extensive product development and, in particular, testing of the manufacturing process for several years through the former dedicated manufacturing facility at Ellesmere Port (e.g. optimising furnace FY15); iii) IP has developed through qualifying both for industry accreditation standards and each clients' specific track requirements.

- ▶ The industry standards qualification hurdle is a high barrier to competition.

VDA 6.3 imminent – all on track

In terms of industry standards qualifications, Surface Transforms will achieve VDA 6.3, a new quality management system, by late summer 2017, we expect. Indeed, the OEM3 customer's first "trial run" of VDA 6.3 quality approval standard has successfully calibrated Surface Transform's view of its progress towards this achieving this standard. It resulted in an agreed shortlist of outstanding items to close out approval in Q3. This is now required by all German OEMs for series production, we understand. From 2015, Surface Transforms has achieved certification AS9100: Rev C (for aero), also ISO/TS16949: 2009 (international, auto).

Competitive landscape brings clear near-term opportunity

- ▶ The only competitor is BremboSGL, with a large Quandt family (BMW) shareholding. The likely growth in the market size means Surface Transforms' success in no way relies on reducing sales for the 'incumbent'. Surface Transforms' new presence as a robust part of the OEM supply chain expands the market, giving the OEMs much more confidence to design the product into its models.

*Limited competition helps Surface
Transform's route to market*

Any other potential competitors are a long way off and not apparent. It is relevant BremboSGL is 18% owned by BMW, 9.9% by VW and 27.5% by the Quandt family (who in turn own a substantial amount of BMW equity). This is an impressive pedigree but may prove a severe constraint for their product being utilised *as a single source in meaningful volumes* by marques beyond BMW, such as Mercedes (which includes AMG) and the VW Group (which includes Porsche, Audi and Bentley).

Surface Transforms thus i) opens up the market; ii) generates and supplies a market which is currently only circa 5% of the realistic £2bn+ annual size (see page 19). iii) The market now is growing at (only) 10-15% pa in revenue, but as a result of there now being a credible dual source, it is set for significant growth for both players. The dual source needs to be credible (so, for example the factory is crucial – with real, volume capacity). In many commercial situations other than auto OEMs, any second source would be expected to offer a superior product in order to ‘break in’. In this market, however, this is not the case. The OEMs welcome a second source. The product needs to be certified and good but the superiority of the Surface Transforms product (e.g. the two examples given, page 9) is a bonus, rather than being essential.

To compete, Surface Transforms needed a long period of build-up and testing (product and manufacturing). This has now been achieved

To compete, a long period of build-up and testing (product and manufacturing) is required. This has been achieved. Such safety-critical new technology as carbon ceramic brake discs is subject to extensive testing before being designed in. There are barriers to competition but also barriers to entry to each client. Surface Transforms dialogue with each client is at senior level as the component is critical to the model launch date, performance, safety record, specification and cost.

Current Surface Transforms position

Current sales prove the product

Surface Transforms generates small existing sales in the auto market from retrofit for sports cars and in supplying niche OEMs (e.g. Koenigsegg). Further, it is well advanced with tests for a broad range of OEMs, with good potential for full-scale orders from each.

Two small auto OEM clients

Contracts

Surface Transforms currently has two auto OEM clients and also ‘near-OEM’ clients but these are small:

Plus, near OEMs

- ▶ The German auto OEM (OEM 3) pre-production contract since April 2016 was a success and is expected to generate £0.5m sales in the 2018 racing season;
- ▶ one tier 2 supplier nomination to Aston Martin (for the ultra high-end Valkyrie) as of February 2017, with development revenue (£0.25m pa) now ongoing and scope for production revenues from 18 months from now.
- ▶ There are also two ‘near-OEMs’ with small supply contacts in place.
- ▶ The final approval process for the military airframe discs appears delayed – Directors believe this is due to packaging other, multiple engineering changes to one approval process. Start of production is anticipated in 2019. A contract is in place and negotiations for offsetting finance prior to this are underway.

Aero delay

Surface Transforms is under trial with six European/ UK OEMs

As we outlined, OEMs welcome and actively seek a dual-source supply and we are confident Surface Transforms is a better technical product. It is also a proven road-tested product, having had several years’ revenue from auto racing retrofit and aero OEM markets. Retrofit discs are fitted to Porsches, Ferraris and Nissan GTR’s. Surface Transforms in 2016 added three new kits to their Porsche range, three new kits for Ferrari 458 and 430 models and the first kit for Aston Martin V8 Vantage.

The 'game changer' is the potential for an auto OEM client

Full-scale production orders take time in this industry. We understand the potential size of the production order for one German OEM is circa £7m pa. This could only be fulfilled from the new factory and it is not surprising that the OEM would seek certainty of supply. Its £7m appetite would be very approximately 2,500 cars pa (c. 12% of current OEM production). This particular OEM produces 250,000 cars pa.

Once Surface Transforms arrives as the dual source, OEM market size is very large. We estimate a £400m pa market potential (for Mercedes S class type price point upwards) growing to £2bn plus, as costs to OEMs fall (on the rising volumes).

Production cost reduction and volume capacity in place

Surface Transforms has raised production cost efficiencies (page 16), with more to go. Given the product quality (page 9 'superior quality'), gross margins should remain robust (above 60%).

Lead time has reduced eight weeks in the past two years, with significantly more to come – not least because of the new factory being designed on lean manufacturing principles. The supply chain and production process has been well honed and tested. It has been carefully designed, with extensive development-testing put through the former smaller-scale factory. Thus, Surface Transforms has a robust, tried and tested product and manufacturing process. It has a readily-scalable manufacturing (cell) capability.

Risk management

- ▶ At every level, the Board's focus is to minimise risk – to the actual and potential customers and with regards financing of the growth.
- ▶ It communicates regularly at a high level with customers and all six OEM potential clients (one is in pre-production).
- ▶ Sales from pre-production and testing contribute to funding capital expenditure as well as keeping client interaction at senior levels. R&D tax credits are regularly received as a function of the ongoing R&D, typically some £0.35m pa.

High level client contact

Six programmes – all likely to come to fruition

As updated in RNS 20th June 2017

Postponed

OEM contracts and Pre-production testing

The German and UK OEMs have been undertaking tests for some time now. These are precise series of tests with clear internal logic. German OEM 3 is "now expected to introduce the Company's products earlier than expected - on racetrack cars - in 2018. However, extended testing of road cars means volume sales will be delayed by one year..... Engineering work on the Aston Martin order (won in the financial year) continues to plan." (Surface Transforms RNS update 20th June 2017.)

OEM 1 (British) The tests progressed positively and the start of production ("SOP") on this limited-edition car had been expected to be in mid-2018. For reasons unconnected with Surface Transforms this performance car customer has extended the model date and Surface Transforms states this delay is the result of challenges the customer is having with brake system integration – unrelated to the discs. The customer's solution appears to be to ask the competitor for a holistic calliper and disc system offering. OEM 6 (Aston Martin) production timing substitutes for the OEM 1 delay. Surface Transforms continues to include a second model for OEM 1 in its planning – albeit start of production (SOP) date is not currently known – as it will be offering a joint calliper, disc and pad solution to the OEM, replicating the success on Aston Martin.

Late 2020

OEM 2 (British) SOP is due **late 2020**: £1.1m projected mature production sales. A sister company of OEM 3, it thus waits for OEM 3 tests finishing before contractually committing. Thus, completion of the product testing with OEM 3 also amounts to finishing testing for OEM's 2 and 4. Superior heat dissipation is particularly relevant.

A significant vote of confidence:

Revenue from 2018

OEM 3 (German) As announced in July 2016, Surface Transforms signed a pre-production technology development agreement. A formal announcement of the model and customer name is expected by Surface Transforms in late 2017 upon completion of the test and finalisation of supply agreements. The strength of the relationship is demonstrated by the revenues which are anticipated from the motorsport series of this car. These are expected by Surface Transforms to be £500k in the **2018 racing season**, which is revenue from OEM 3 earlier than expected. The customer has recently extended the testing of road car products by six months so the fuller ongoing contract start of production is set for **second half 2020**. This will be for the same model and with the same volumes as formerly anticipated. Surface Transforms is confident it can meet the customer's technical and timing requirements. Arduous as ever, testing is expected to complete in this calendar year. We are not unduly concerned by the delays in 2020 as this is the natural, rigorous state of affairs in this industry – the Surface Transforms contribution being both crucial and small in size within the whole programme.

Main production lines commence later 2020, with estimated eventual run rate c. £7m pa

Late 2020

OEM 4 (German) SOP is currently scheduled for **late 2020**. This is a sister company to OEM 3. Current testing required by OEM 3 should not need to be duplicated.

Late 2019

OEM 5 (German) A competitor to OEMs 2, 3 and 4, **late-2019** SOP is currently scheduled; expected initial revenues of £2.5m, not far from the ongoing mature level of sales. It has recently confirmed this date, continuing to test with positive feedback.

Small – current ongoing

OEM 6 (Aston Martin Valkyrie) This is a tier 2 supplier, nominated since **February 2017**, with £0.25m pa development revenues ongoing. Production revenues should be higher, but not significantly so. This is proceeding to plan for launch **January 2019**. The company sees this as point of entry to a vehicle manufacturer producing 4,000 cars per annum (potentially 16,000 discs) albeit there are no hard commitments from the customer.

Pre-production development income continues

Aerospace: The pre-production contract remains in place. Some £0.3m in total has been received to date. As previously reported by Surface Transforms, testing has been completed and the only outstanding issue is formal sign off by US Naval Air Command and the aeroplane manufacture. However, this “sign off” continues to be delayed, for reasons that seem to be the result of the aeroplane customer wanting to “package” a number of changes at the same time. Surface Transforms is in discussions with its landing gear customer with regard to the financial implications of this airframe delay. The launch date was a fundamental feature of the original commercial agreement. These discussions include continuance of development income if production income is delayed for reasons within the customer's responsibility. These discussions are on-going.

As stated on 20th June, “management is in discussions with immediate landing gear customer for a commercial response to offset the consequences of this airframe delay.”

New factory opened early 2017

Former Ellesmere Port manufacturing site moved to the new modern, optimally-designed facility in Knowsley, Liverpool with 20-fold larger capacity

The new factory brings all the production expertise to date into an effective, scalable, efficient facility. Surface Transforms moved its Ellesmere Port manufacturing site in late 2016 to the new facility in Knowsley, Liverpool. Such a move (nearly an hour's drivetime from the original site) is a significant de-risking and facilitates both substantial (20-fold, in stages) volume-capacity rise and cost reduction. As scheduled, there were production interruptions during the move.

This new facility adopts a cell structure, with each of the five cells having a 20,000 disc capacity. This scalability and surety of replication of the process in each new cell is crucial for volume OEMs. The eventual capacity of 100,000 discs compares to a EU car registration level of over 12m pa (48m wheels).

Surface Transforms ordered key items of plant, totalling approaching £5m, which support a total annual capacity of over 20,000 discs (vs 4,000 in the old factory). Local authority grants and interest free loans of £0.5m will be received, offset against the capital expenditure. See our Financial Analysis section for the cash flow impact.

Risks and costs (including sales disruption) in the past – benefits now

A factory move is not without risks, but its successful completion changes the risk profile to the OEMs very materially. Surface Transforms' good execution brings cost, supply-security and scalability advantages.

Surface Transforms' industrial process

Summary

A factory move intrinsically brings risks. Although the move was not without pain, that risk is now behind the business. There are now new opportunities in cost, supply-security and scalability – it will also have boosted OEMs' confidence in ST's ability to execute further improvements.

Quality, cost and cycle times all see ongoing improvements

The many years' expertise built-up in-house in the manufacturing process resulted in a robust and very effective major factory relocation process. Success here gives us high confidence in future, successful commissioning of major pieces of capital equipment. The success of the factory move, and the manner in which the new site is configured enables easy growth through copying the existing 'cell' structure, a major de-risking of the manufactured process. "Except for the ceramic furnaces, all the new equipment is on order, at prices broadly in line with budget. Deliveries start late June and will continue over the next year." (Surface Transforms update 20th June 2017.)

Factory 'execution' timed to support where ST wants to go with the six OEMs

This supports the relationship with the OEMs. They wish – we would expect – to see:

- ▶ Ability to execute ongoing cost cuts (achieved – the factory move underpins confidence in commissioning the new furnace in 2018);
- ▶ ability to expand volumes securely (achieved – a cellular structure can be rolled out into a large modern manufacturing facility);
- ▶ resilience by relying on in-house volume processes and secure supply of energy. For example, there is a large reconfigured gas supply infrastructure and an on-site Combined Heat and Power (CHP) plant, both owned by Surface Transforms.

Continuous improvement with two 2017 step changes

- ▶ This is a high-precision chemically complex product. Further, the challenging engineering skills (such as the machining) demanded have been mastered.
- ▶ Surface Transforms has stated the phase one cost reduction programme will be complete when all the new equipment has been delivered. Additionally, in the year, further significant further cost reductions have been identified from a number of sources. This included the use of a Combined Heat and Power Plant on the new site and increased purchasing power on gas supplies. See page 16 for reduction stages.

Surface Transforms is securing continuous advances in the quality, cost and timing of its process. It has moved the four-stage process (incorporating 11 sub processes) to larger well laid-out premises, reduced costs and is well-advanced in securing significantly lower costs and speed the process. We consider these all to be crucial for the OEM customers. The commissioning of the new factory has worked very well, albeit with production delays during the transfer period, (primarily due to complex customisation of the gas mains infrastructure).

The four-stage production process involves complex chemistry and engineering – all developed by Surface Transforms. It has perfected and applied a wide range of IP within its manufacturing process.

Applying this in-house IP to the new factory (in a large modern industrial estate near Liverpool) represents a major ‘proof-of-the-pudding’ for OEMs who look for manufacturing expertise.

- ▶ The knowhow acquired has also enabled new pieces of equipment to be specified and ordered;
- ▶ this will form the cornerstone of a new volume-production manufacturing ‘cell’, raising the current 4,000 (2,500 automotive and 1,500 aerospace) annual disc capacity by 17,000 (or more) to (conservatively) 21,000;
- ▶ it will speed cycle time significantly;
- ▶ costs have already reduced to a competitive figure and are set to reduce further in the remainder of 2017 and again, beyond.

Investment in a limited number of manufacturing assets 1) reduces costs; 2) speeds the process; 3) increases the volume throughput. Current capacity is some 4,000 discs pa but this is set to rise five-fold within the next months (mid 2018).

New factory, now operational for some months

Surface Transforms relocated its production to a modern factory in a modern, extensive industrial estate near Liverpool over a period between late 2016 and the start of 2017.

The company now possesses the space and infrastructure to eventually produce over 100,000 discs per annum, achieved by replicating the current cell into further cells. This would be the basis for well over £50m sales turnover at the current expected ‘mature’ market price, albeit prices will be higher in the early stages of a developing manufacturing process/market. Less than 15% of the footprint is dedicated to the current 4,000 disc capacity. The factory has two other zones. One comprises an area

Mastering this complex four-stage process is a major achievement and the new factory is ‘proof-of-the-pudding’

Major additional investment comes on-stream early in 2018

All this ties in to a quantum raise of volumes and reduction of cycle times.....

....and of course the costs

Knowsley Business Park

Surface Transforms

4,000 disc capacity; 20,000 further early 2018, up to 100,000 scope in due course

2018 brings the new furnace which enables the new, large-volume cell to be commissioned

2018 is the first step and clarity and confidence to OEMs wishing a seamless expansion at their suppliers

Each expansion project is the commissioning of a new cell

which can accommodate three x 20,000 discs pa output cells and another space could provide two cells at 20,000 pa output.

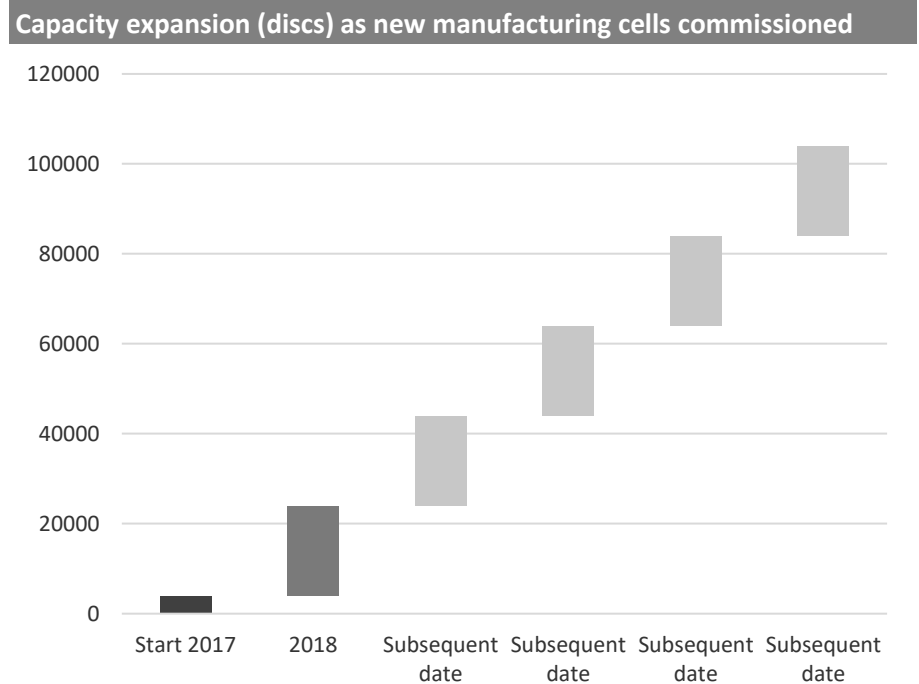
In early 2018 further capital equipment will be commissioned, to enhance in-house processes. This will be the full optimisation of the first of these enhanced-volume cells. To get to this point, Surface Transforms' engineering process has been developed over a number of years:

- ▶ Optimising the engineering qualities of the finished product;
- ▶ improving the process and reducing costs where possible;
- ▶ identifying areas where investment is required to improve the process and reduce costs.

New high-volume furnace coming this month

To that end, the next CVI furnace, which is the first for the large-volume cell, has been ordered and we anticipate commissioning to take place between July this year and January 2018. A new machining and tooling centre has been a critical positive piece in the improvements. It takes some 18 months or more to commission a new manufacturing cell, so, with Surface Transforms well advanced, any capacity expansion elsewhere in the industry is constrained. This investment enhances various processes, saving a variety of costs including materials and time.

The cellular (i.e. consistently repeatable) nature of the process now, allied to the floorspace to expand, gives the OEMs the confidence that Surface Transforms can grow their batch throughput hand in hand with their potential demand increases.



Source: Hardman & Co Research

The cell structure means future growth can simply be fulfilled by replicating the first cell.

The process – therefore – is robust and importantly the product appears superior to existing competition

The materials technology/ chemistry/ engineering is not something readily replicated

Costs are falling – the visibility of how this is achieved is high

Engineered-in best-of-breed

The engineered-in superiority of the product stands principally on its lower running temperature once operating. This is 150° C cooler than the competition, for the same kinetic energy of a car's speed and weight. This is a significant part of the reason for the lighter weight than the competition. There are also strength and durability improvements, in part from the structured alignment of the original carbon fibres.

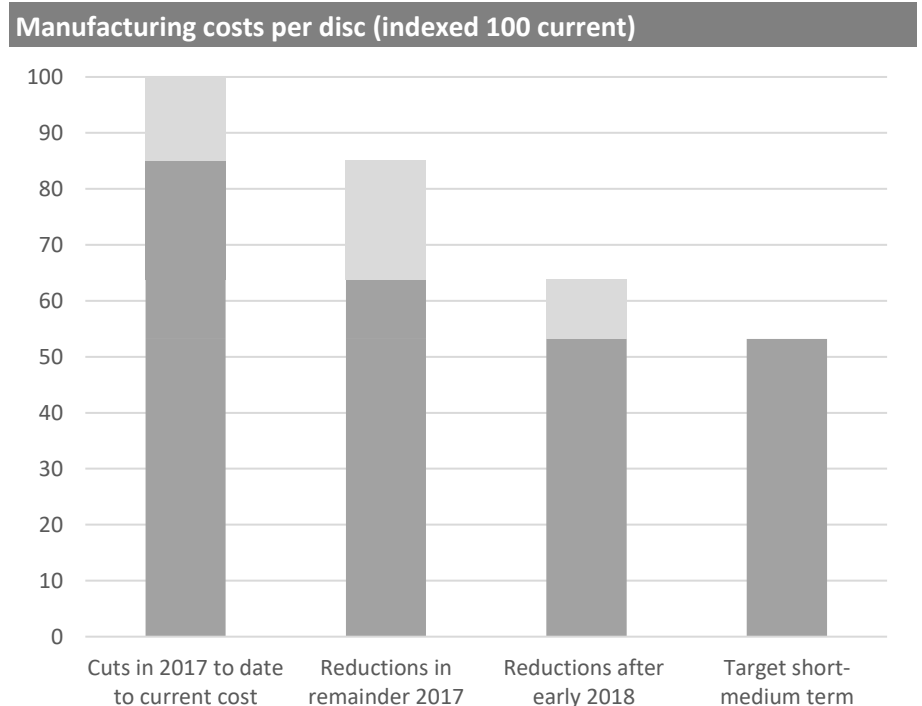
The process has over the years been improved significantly – but there is still room for further advances. The superiority of the product is 'built-in' and hard to emulate.

Cost and weight reductions

Cost (including cycle-time) reductions

A new portable combined heat power plant has been installed, recycling gas (90% of which was wasted formerly). There is also an energy saving for electricity of c.30% by using wood pellets. The gas pipe has had to be moved, with the pipe fully owned by Surface Transforms. Numerous process efficiencies are being achieved.

The last bar in the chart below, includes other cost savings in process (with implications for energy use and time of completion) and raw materials savings.



Source: Hardman & Co Research

The four stages of production

First – weave together and align the carbon fibres

The alignment gives structural strength – a positive point of differentiation vs competition

One of several complex chemical procedures

Atomic alignment is key

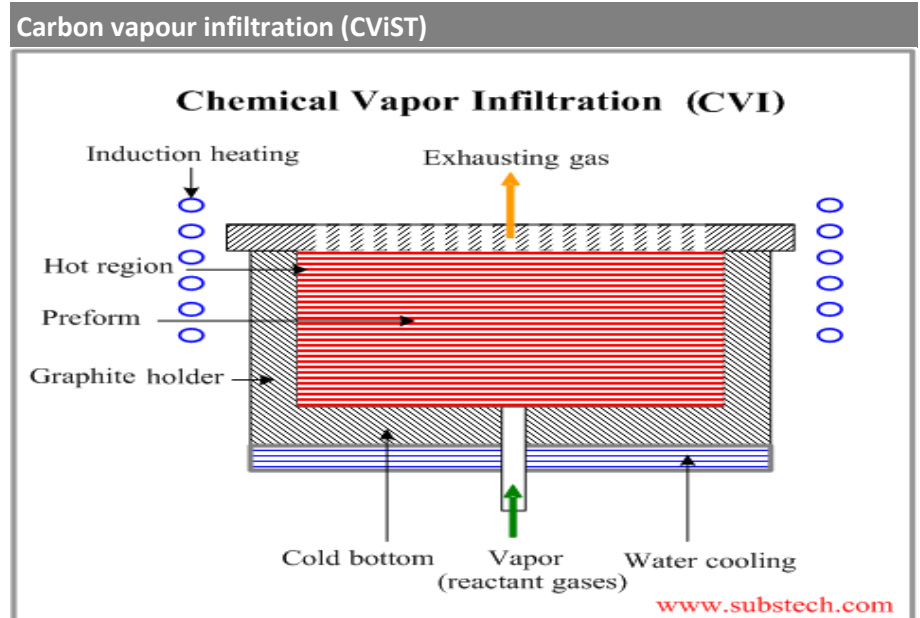
Stage 1 Make the OxPAN preform

Felted squares of fibre are received, needle stitch-machined to form in cross layers then cut. The machining is undertaken so that all fibres are aligned in the X or the Y axis. The needles are micro-crochet and the complexity of the set-up alignment of the needles exceeds one million potential permutations. If the shuttle speed is not exactly correct the needles will break and eventually abort the process which binds up to 30 layers. Then pre-formed carbonisation occurs (hardly using any gas). Polyacrylonitrile (PAN) is fabricated into a polymer nanofiber mat. A very important property of the 'mat' as fabricated by Surface Transforms is the regular alignment of the fibres which is key to consistency and handling characteristics of the rotor. The alignment gives structural strength and is a different configuration to that of the competitor – a positive point of differentiation.

Stage 2 Carbonisation

The carbon fibre (OxPAN) pre-forms are heated to a temperature of (1,000-3,000° C) in a furnace filled with a gas mixture that does not contain oxygen. The lack of oxygen prevents the carbon from burning. Upon heating, the pre-forms begin to lose their non-carbon atoms in the form of various gases. As these atoms are expelled, the remaining carbon atoms form tightly bonded carbon crystals, aligned more or less parallel to the long axis of the fibres. Note that this process uses very little gas.

Stage 3 Make the carbon ceramic blank



Source: Surface Transforms

Adding more carbon – the CVI furnace...

The ST product 'runs cooler' due to atomic structure

This process densifies fibres with further pure graphite 'laminar' carbon crystals. Natural gas is introduced into the bottom and sucked straight out after carbon has been stripped off. Solid carbon material grows atom by atom. This builds layers to 'duct' heat out. It is thus a key issue behind the superior performance derived from cooler running of the disc (150° C cooler than the competition). It builds up the carbon content to 6kg once more, operating 500 discs at a time. Testing is through microscopic calibrating of how light bounces off the fibre. Heat treatment is then undertaken.

After heat treatment and between two machining stages, the MiST process adds silicon thereby hardening further

Stage 4 Make the ceramic rotor: treating, machining, MiST, coating

After a heat treatment stage (to minimise energy costs, the disc itself acts as the heating element, rising to 1700° C), rotors are 'green-state' machined (for cooling properties 'in service') and weight-reducing vents/holes cut. Then, the MiST (melt infiltration) process runs overnight (circa 16 hours). This infuses silicon to make hard silicon carbide from a carbon ceramic 'sponge', hardening the disc further. After a further short period of highly specialist machining, sintering and a coating is added to prevent oxidisation. This machining of such a hard material is exceptionally specialised, with significant IP generated by/for Surface Transforms (indeed the company co-operated with local academic institutions on a knowledge transfer process in this regards). This whole process is repeated and lasts three days. The final coating is 'self-healing' in that as the disc in use heats – up to 500° C – the coating moves over to cover scratches. After a finish grind, balance and inspection including by laser, the rotor with the disc assembly added is ready for despatch.

The size of the opportunity

Effective supply from a second source

Typically, luxury and upper middle cars adopt earlier stage new technology. We estimate clear demand here for in excess of £400m carbon ceramic brakes....

... There is a clear path to a £2bn+ market in £40,000+ RRP models

A competitor opened the market but in ten years growth has been slow

Surface Transforms has the potential to revolutionise (i.e. grow 20+ fold) this market

Without its new factory, this was not deliverable

Auto OEM component markets tend to grow significantly once there are two suppliers.

We consider the clear market size potential is £2bn+. We attempt to give more detail as to sub-categories within that growth. We consider a 'highly visible near term' market of £400m. The £2bn assumes well under half of cars selling for between £50,000 and £100,000 take the product – potentially only on the driven axle for more mid-range cars and with a minimal take up below that price range. Over time as manufacturers of mid-range vehicles see the brand benefit and as the pricing evolves, the likely market size expands further still.

Typically, in the early stages a new technology is adopted on luxury and upper middle cars. We estimate that annual sales of European cars with a RRP above £100,000 are 60,000 approximately; thus, this market alone is worth £150m.

Between £40,000 and £100,000 RRP, European new registration volumes are c. 1m pa, (taking a conservative view of SUV/ off-road). The data source is European Vehicle Market Statistics, (which separates non-price categories such as SUV/ off-road thereby requiring extrapolation). Assuming 20% take-up of carbon ceramic brake discs (and our conservative SUV estimate), this market is worth some £250m pa – or more.

- ▶ Our £400m 'highly visible near-term' market takes account only of cars selling at very approximately £60,000 plus, with assumptions of only a proportion of cars (particularly those selling below £100,000) taking carbon ceramic brakes near-term.
- ▶ There is a clear path to £2bn+ assessing the likely take-up of the £40,000+ RRP segment, with further growth beyond that in due course.

We anticipate global sales but with a strong focus on the European markets.

Summary of the market-wide position to date

- ▶ As we have pointed to, a competitor j.v., part of a larger group, has kick-started the market over the past near-decade in the racing and luxury market.
- ▶ However, OEMs demand dual supply, seldom volume buying without the second source.
- ▶ Surface Transforms provides that second source of supply, now that the product has several years' track record and the company has successfully moved into its new larger factory.
- ▶ The larger Surface Transforms factory has a 20,000 disc pa capacity (readily enlarged), some £16m pa sales once filled at the lower volume selling price being negotiated for early stage contracts.
- ▶ Surface Transforms holds a pre-production agreement with a German OEM, the eventual size of which would be a £10m pa run-rate, assuming success with ongoing testing.

Creating a dual-source industry

Surface Transforms operates in a market searching for secure dual source supply of a cost effective nature

Surface Transforms is the second source and the new factory transforms this into effective supply

It is continually working its costs down, has a superior product and is now the emerging second supply source

£400m pa market (4x current) ignoring cars below Mercedes S and assuming only EU registrations

Whatever the potential market size – it is significant

There are strong and obvious factors almost forcing OEMs to look to a second supply source for components used in any kind of volume. As the alternative to the current dominant player Surface Transforms is well placed to benefit.

Auto products with high environmental and performance benefits do not long last as low volume, single source, expensive products. OEMs seek out a credible second supplier. Surface Transforms is continually engineering out costs, has a superior product and, with its new factory, is now the emerging second supply source. It is inevitably the case in automotive OEM that when costs fall for a relatively new component product, volumes multiply. Elsewhere in this document we illustrate one analogous example but, whatever the growth, Surface Transforms addresses a major opportunity with multiple customers and without having to oust the existing main supplier. To embed this, it has to keep working down costs and pass those to the buyers.

- ▶ Surface Transforms has engineered out costs and has specific programmes (both related to engineering and new volume capacities) in position to reduce costs (by a further 30-40%).

Automotive customers are averse to single source situations, so Surface Transforms needs to sell at least an equal product in order to break in. As we shall outline, we are confident Surface Transforms is indeed a better product. It is also a proven product, having had several years' revenue from auto racing retrofit and also aero OEM market. It supplies Porsche, Ferrari and Nissan owners and many others.

The 'game changer' is the potential for an auto OEM client for full-production. Pre-production orders are being executed currently. The current position of small orders and ongoing tests is fruitful as it provides i) some cash flow and ii) steady 'staging posts' to the full-production auto OEM. The decision by OEM 3 to introduce the product onto a smaller-volume race car is a typical 'disruptive technology' introduction strategy, a proving ground where they are gathering data.

Luxury and 'upper medium' market potential

Let us turn to the wider market position. There is relatively clear market potential in the short term for sales to reach £400m pa for vehicles such as Mercedes S Class upwards. In auto OEM terms, this is not a hugely ambitious market size. We consider it just a first step, with plenty more scope beyond. And recall – we consider this will be for some time a two-supplier market.

- ▶ In broad terms, this breaks down into £150m pa to luxury (over £100,000);
- ▶ £250m pa to 'upper medium' such as Mercedes AMG or lower end S class, broadly £40,000 to £100,000. This assumes an illustrative 20% taking carbon ceramic discs (if one makes assumptions regarding the SUV / off road category within the official European Vehicle Market Statistics data) and very modest sales to RRP below circa £60,000 models.
- ▶ There is clearly much further market expansion beyond this, over a none-too-extended timeframe. Market size potential is £2bn+, we consider.

It is to be noted that total EU car registrations number over 12m pa, with sport, luxury and upper medium (excluding SUV / off road) comprising some 6% of this

volume figure. (Source: European Vehicle Market Statistics, which defines 'upper medium' as £40,000 to £100,000 RRP, such as Mercedes AMG or lower end S class. (i.e. it would not include Audi A6 or BMW 5-series in this range).

£400m highly visible, £2bn a likely potential

Market size potential is £2bn+, we consider, with a highly visible market of £400m. The £2bn assumes under half of cars selling for between £50,000 and £100,000 take the product – potentially only on the drive axle for more mid-range cars. Effectively, the £400m market aspiration takes account principally only of cars selling at £60,000 plus, with a very small amount in the £40,000 to £60,000 range.

No hard and fast parameters but an extensive list of other value-creating components have grown to far beyond these quantum

As the product price evolves and the OEMs see more and more brand benefit to sales in the mid-range, the market growth potential is very large. There are no hard and fast delineations but an extensive list of other value-creating components which have grown to these types of volumes and far beyond.

Surface Transforms discs will open up the market size and its commercial potential is based on taking a share of this market growth, not in attacking the competitor for share. This is where its efforts lie, and its success in securing the six OEMs where its product is in extensive testing demonstrates ongoing delivery. On five of them, testing has been progressing for over three years – not an unusual timespan

Lead times and security of supply are key to the OEMs. Before Surface Transforms' Knowsley facility was opened, these were issues (i.e. 99% of global supply, prior, was with the competitor). The new site can be scaled to equal c.50% the current output of the competitor. The Directors would be pleased, we understand, with approximately one third of the overall market within some five years.

The market is currently small and young, at circa £100m pa, 99% supplied by BremboSGL.

BremboSGL: its success in opening the market; its constraints from here

The BremboSGL joint venture was created in 2009 and its first sales of carbon ceramic discs (of some €70m) were in that year, with the Brembo partner being a well-established brake systems manufacturer. Surface Transforms has been 'serving its time', successfully proving the product and the manufacturing resilience. The first sales for Surface Transforms were well over a decade ago.

The only competitor, BremboSGL, is currently much larger, but remains, in auto industry terms, still a niche market. BremboSGL is growing, but relatively slowly, at some 10-15% CAGR. Its niche is the luxury end. We estimate EU registrations of cars with a RRP of £100,000 or higher to total some 60,000 pa, so BremboSGL's growth is relatively steady, having achieved good penetration in the racing and luxury markets, but has struggled to reach broader markets.

It is not surprising that currently the market is niche and growing, but not in the exciting way we anticipate. The OEMs – as ever – are looking for dual supply and production efficiency-driven cost reductions. This is happening - delivered by Surface Transforms and its 2017 factory.

The demand/ price curve

We see a realistic target of £400m for carbon discs, were only a minority segment of the market with RRP over £40,000 to be fitted with carbon ceramic brake discs (including some at the lower end with discs solely on the driving axle).

We see 'low risk' route to expect £400m pa market, with Surface Transforms the leader – and aspire to a much larger market still

Once volumes rise to this level, manufacturing and selling prices will likely have been engineered down (we have outlined the Surface Transforms specific programmes). It is also highly likely that, as costs fall, the take-up will spread to the middle market (e.g. Audi A4 etc). We have illustrated above the scope for £400m sales to luxury and

upper middle. Realistically, in time, the market will certainly reach further (with adoption of this innovation growing like other automotive efficiency/regulatory/safety/ performance components) but quantum and timing are to be determined. This would be a quantum change beyond anything required to fill Surface Transforms' current factory, even were it to be running at its full sales rate (significantly over £50m pa).

Given the benefits to customers' 'feel' of the car and to the OEMs compliance with emissions (weight) and marketing benefits, as well as the superiority of the Surface Transforms product to the competition: we are confident gross margins will remain resilient.

Board and senior management

The Board

Extensive expertise in automotive brakes.....

...chemistry

Major shareholder

Carbon components and materials

Senior Management

David Bundred, Non Executive Chairman

David Bundred has 30 years automotive experience, with a particular speciality in the brake systems segment. Formerly he was CEO of TMD Friction GmbH a €600m sales, private, German-headquartered company, one of the world's leading automotive brake pad system suppliers. He was formerly COO of Lucas Aerospace. He led the industry introduction of anti lock brakes. He holds an MBA from Cranfield University and is both a chartered engineer and chartered management accountant.

Dr Kevin Johnson, Chief Executive Officer

Kevin Johnson has a doctorate in Chemistry from the University of Liverpool and an MBA from Manchester Business School. He has spent six years in chemical industry product development and has broad experience with OEMs in the area of new technology development, previously working for Avecia (former AstraZeneca).

Kevin D'Silva, Non-Executive Director

Kevin D'Silva's has been CEO or chairman of several medical private and public companies. He is an MBA, chemical engineer and University of Leeds graduate.

Richard Gledhill, Non-Executive Director

Richard Gledhill 's principal activity has been, and continues to be, the building and developing of USG-Gledco Ltd, which produces mechanical carbon components and materials for the aerospace and oil and gas industries from the UK, USA and Mexico.

David Allen, Finance Manager

David Allen is a Fellow of the Chartered Association of Certified Accountants. He joined February 2014 having worked previously for a number of large public limited companies including Tyco Corp and Bodycote International plc.

Des Farrell, Operations Manager

Des Farrell has had a 28 year career with Air Liquide UK, responsible for 13 factories across the UK. His operational management experience is focused within the chemical, gases and pharmaceutical industries and includes detailed knowledge of the control of hazardous substances and emission regulations.

Michael Sinai, European Sales Manager

Michael Sinai is based in Germany and has 20 years' automotive industry experience, including senior sales positions at Bosch, Trimble and Flextronics.

Peter Studer, Sales & Marketing Manager

Peter Studer has over 20 years' experience working in senior, automotive and motorsport customer-focused roles, including sales for Multimatic Ltd. Peter has worked for Lotus and has a Coventry University degree in Mechanical Engineering.

Geoff Whitfield, Engineering Manager

Geoff Whitfield has over 15 years' experience in automotive and aerospace product and process design, development and testing. This includes polymer composite product design and testing, and high volume manufacturing. Geoff has a BSc (Hon) in aeronautical engineering and an MSc in engineering (composite materials) from the University of the Witwatersrand in South Africa.

Risks and mitigation

Cash burn

1. **Cash flow.** Although Surface Transforms has been selling carbon ceramic discs for many years, the quantum to date has been modest, largely to the retrofit market and niche OEMs (e.g Koenigsegg). As a result of this and the strong repeat R&D, free cash flow has been negative. Aero, auto retrofit and niche sales mitigate the cash burn, but meaningful, positive cash flow has to wait until the first 'non-niche' automotive OEM production sales volumes.

Currently inventories and work in progress (£0.57m end FY16) are a meaningful % of sales – a function of the modest level of sales and certain minimum-size contracts with supply chain partners. Whilst we make allowance for modest Work-in-Progress (WIP) outflow in our cash flow model (and note that trade receivables have consistently run below trade payables) – we do not anticipate onerous WIP implications for the OEM supplies. This is, however, yet to be demonstrated.

IP and product superiority

2. **Intellectual property.** The company's IP has been crucial to securing orders and to the manufacturing process. Industry standards qualification has been secured as required, with imminent granting of the latest industry qualification confidently expected. It would be difficult for a competitor to copy the company's processes, even without patent protection, since the detail of, for example, temperatures is critical. Surface Transforms considers its technology to be superior to its competitors as a result of a number of factors in the manufacturing process, including alignment of fibres and a lower running temperature once operating (150° C cooler than the competition for the same vehicle kinetic energy).

Strong competitive position – and not needing to take volume from the competitor

3. **Competitive position.** There is only one competitor, BremboSGL, and the substantial ownership of it by the Quandt family (the owners of BMW), makes other OEMs cautious, offering a very significant opportunity for Surface Transforms. The total market for carbon ceramic discs is unlikely to be large enough for some time to tempt another, iron, disc manufacturer to contemplate entering the market.

New factory successful commissioning, modular structure for easy expansion; cost cutting

4. **New factory.** This mitigates i) the order fulfilment risk as seen by the potential customer; ii) the risk faced by Surface Transforms in expanding production. To be specified in any meaningful volume, Surface Transforms still has to cut its manufacturing costs. Each programme to achieve this is clearly calibrated.

5. **Further detailed points.** we highlight the following:

- ▶ Surface Transforms' position to the existing aero manufacturer is Tier 1 supplier. Its position with four out of the six 'volume' auto OEMs is as Tier 1.
- ▶ 61% FY16 (78% FY15) revenue was from Europe ex-UK. There is no material currency exposure. A 10% strengthening in £/€ and also of £/US\$ would impact profits by an immaterial £1,000. Going forward, OEM volume-contracts will likely be €-priced.
- ▶ Energy accounts for c. 25% of production costs, which should fall, partly through the new Combined Heat and Power facility.
- ▶ Staff costs FY16 totalled £1.2m. There is no defined benefit pension obligation.
- ▶ In terms of market/ trading uncertainties, product sales are expected to decline in the race markets but continue to grow in the retrofit and niche vehicle

markets with an increasing number of distributors and niche vehicles. This uncertainty is constantly assessed by regular customer meetings and monitoring the level of enquiries and orders for both the company's products and industry wide. In addition, the company faces the continued uncertainty created by the global economic and political climate.

- ▶ A more significant concern is the risk of exit from the single EU market and possible trade barriers. Whichever way this develops, the product is a high gross margin sale.

Financial analysis

Placing, Subscription for £3.0m and Open offer of £0.5m

We refer to the successful fund raise – see 6th July RNS. Surface Transforms announced it was carrying out a Placing, Subscription and Open Offer of up to approximately 22,580,806 new Ordinary Shares at a price of 15.5 pence per share.

17.42m new shares have been confirmed successfully placed.

1.96m new shares are confirmed as successfully subscribed (by Directors).

The Open offer (to existing shareholders) for up to 3.23m shares closes later in July.

Gross proceeds would total £3.5m on the basis of a full subscription by existing shareholders. £3.0m (gross) is confirmed on the basis of the Placing and Subscription.

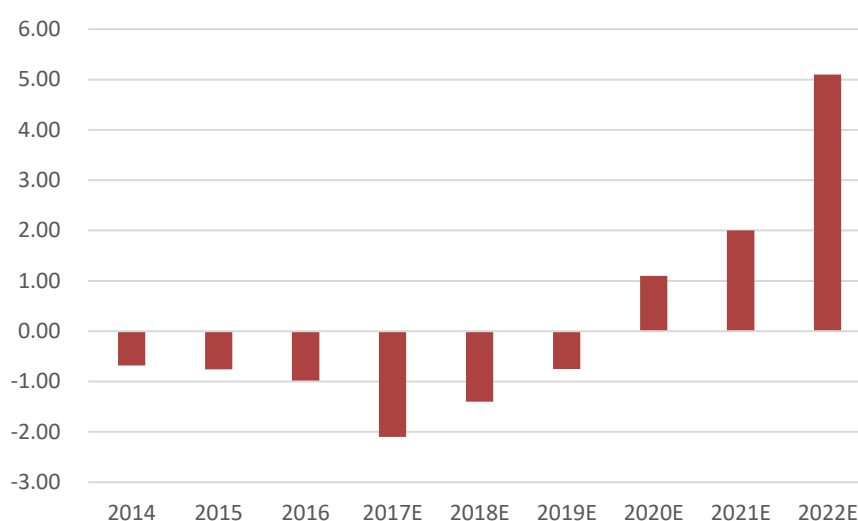
Revenue account								
May Year end £m	2015	2016	2017E	2018E	2019E	2020E	2021E	2022E
Revenue								
Sales	1.07	1.36	0.70	1.50	2.90	7.50	10.90	16.00
Gross profit	0.55	0.67	0.45	1.00	2.12	5.00	6.90	10.04
Gross margin %	51.40	49.26	64.29	66.67	73.00	66.67	63.30	62.75
R&D & Overheads	-1.38	-1.82	-2.75	-2.60	-2.77	-3.75	-4.80	-4.74
EBITDA [1]	-0.83	-1.15	-2.30	-1.60	-0.65	1.25	2.10	5.30
EBITDA margin %	loss	loss	loss	loss	loss	16.67	19.27	33.13
EBITA [1]	-0.94	-1.26	-2.45	-1.90	-1.10	0.75	1.60	4.70
EBITA margin	loss	loss	loss	loss	loss	10.00	14.68	29.38
Net Finance income	-0.04	-0.03	0.00	0.00	0.00	0.00	0.00	0.00
Profit before tax (adj.)	-0.98	-1.29	-2.45	-1.90	-1.10	0.75	1.60	4.70
Exceptional items	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tax credit	0.22	0.31	0.35	0.50	0.35	0.35	0.40	0.40
PAT	-0.76	-0.98	-2.10	-1.40	-0.75	1.10	2.00	5.10
EPS (p) Diluted adjusted	-1.64	-1.68	-2.33	-1.28	-0.66	0.98	1.77	4.52
DPS (p)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average shares in issue (m)	46.40	56.50	90.00	109.0	112.8	112.8	112.8	112.8

Source: Surface Transforms accounts; Hardman & Co Research estimates

[1] includes 'other income' principally grant income of £0.07m; £0.11m; £0.08m for years FY14 - FY16

Note re gross margin variability – the development revenue margins at 100% will be one factor in the 'mix' impacting gross margins

Profit after tax credits (£m)



Source: Surface Transforms and Hardman Research estimates

Balance sheet

May Year end £m	2014	2015	2016	2017E	2018E	2019E	2020E	2021E
Net current assets (incl cash)	1.06	1.61	5.99	2.53	2.83	1.73	3.13	4.93
Shareholders' funds	0.64	1.20	6.00	3.95	5.85	5.10	6.20	8.20
Net cash (debt)	-0.27	0.42	4.76	1.53	1.83	0.73	2.13	3.93

Source: Surface Transforms accounts; Hardman & Co Research estimates

Cash flow

May Year end £m	2014	2015	2016	2017E	2018E	2019E	2020E	2021E
Cash from operations net tax	-0.45	-0.59	-0.91	-1.78	-1.10	-0.10	1.50	1.90
Capex	-0.06	-0.01	-0.24	-1.50	-1.90	-1.00	-0.10	-0.10
Interest	-0.01	-0.05	-0.05	0.00	0.00	0.00	0.00	0.00
Equity issuance	0.33	1.30	5.14	0.05	3.30	0.00	0.00	0.00
Net cash flow	-0.19	0.65	3.94	-3.23	0.30	-1.10	1.40	1.80

Source: Surface Transforms accounts; Hardman & Co Research estimates

Placing and Subscription confirmed. £0.5m open offer is currently proceeding. Our estimates assume the open offer succeeds.

Note from FY20E onwards the modest levels of maintenance capital expenditure. Capex in FY17,18,19 relates to the factory and equipment commissioned or shortly commissioned, on order.

A significant wip (work in progress) benefit accrues over time as new processes are rolled out.

A significant benefit to wip also occurs as the scale of the business increases. We have taken these factors into account within our model for cash from operations. Tax credits continue – based on R&D – even post achieving profitability until brought forward taxable losses are extinguished.

Notes

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