

Strategic Report

The directors present their Strategic Report for the year ended 30 June 2023.

PRINCIPAL ACTIVITIES

Haydale has three principal activities:

- The plasma functionalisation of nanomaterials for third party applications through our patented HDPlas® process;
- The development, manufacture and sale of products using plasma functionalised nanomaterials to primarily address the heating and sensor markets; and
- The manufacture and sale of proprietary silicon carbide (“SiC”) whisker powders and high wear resistant cutting tools for use primarily in the aerospace and automotive industries.

These activities are explained in more detail on page 1 and pages 4 to 6 below. The first two nanomaterial business activities are based in the UK with a sales presence in Asia. The SiC activities are based in North America with a sales reach into Europe and the far East.

At 30 June 2023, the Group has the following operational activities across its five facilities.

<i>Haydale subsidiary</i>	<i>Location</i>	<i>Principal activities</i>
Haydale Limited	Ammanford, Wales	Specialist plasma functionalisation and manufacturing facility producing inks, resins, fluids and masterbatches to be used in composites and polymers for direct sales to customers and for transfer to other Group sites.
Haydale Composite Solutions Limited (“HCS”)	Loughborough, England	Sales of masterbatch and pre-preg composites, elastomers, other nanomaterials and the provision of advanced consulting.
Haydale Technologies (Korea) Limited (“HTK”)	Seoul, South Korea	Dedicated sales office servicing the fast-moving South Korean and other APAC markets.
Haydale Technologies (Thailand) Company Limited (“HTT”)	Bangkok, Thailand	Sales office servicing the APAC region with plasma functionalisation and R&D capability.
Haydale Technologies, Inc. and its wholly owned subsidiary Haydale Ceramic Technologies LLC (“HCT”)	Greer, SC, USA	SiC and cutting tool manufacturing facility with sales office serving the North American market and developing the European and East Asian markets.

REVENUE MODEL

The Group’s revenue model is based on the following strands:

- Sale of functionalised material in powder, masterbatch, fluid or pre-preg format;
- Strategic partnerships with industry players through whom products and plasma functionalised material can be taken to market;
- Sale of SiC microfibres and whiskers, SiC tooling, ceramic blends and ceramic blanks to the steel mill, aerospace and automotive sectors and the coatings industry;
- Sale of own brand and third-party products which clearly align with our principal activities or customer base;
- Sale or lease of plasma reactors with appropriate licencing for use of the patented HDPlas® functionalisation process; and
- Consultancy services with respect to testing the potential enhancements that our product range and engineering acumen may bring to customer applications.

Strategic Report *(continued)*

COMMERCIAL OVERVIEW

FY23 has seen the Group's US operations continue its progress as demand returns for SiC powders and tooling in the aerospace and automotive industries. This has driven the overall FY23 revenue growth of the Group and looks set to help support the Group moving forwards with the expansion into the manufacture and sale of SiC tooling through a network of regional manufacturer representatives recently engaged across the USA. The UK based nanomaterial business has made significant steps in commercialising its portfolio of technology, especially in terms of business collaborations with significant industry players in key markets, having previously installed sufficient capacity to be able to process commercial levels of plasma functionalised nanomaterials for those partners and other third parties. These collaborations are expected to form a solid base to the expected progress in the current financial year.

NANOMATERIALS

The UK operations made significant progress over the year in progressing commercialisation of its proprietary technology which resulted in a number of key agreements being signed with industry partners in the last quarter of FY23 and first quarter of FY24. We anticipate these may lead to significant volume sales as those products and relationships mature over the next few years. Whilst progress on commercial arrangements has been strong, it is taking longer than expected for this to translate into revenue and, primarily due to one large functionalised product sale (goods) in FY22 not being repeated in FY23, total UK sales reduced by £0.20 million on prior year. Other UK consultancy revenues (services) grew by 10.2% on a like-for-like basis.

Patented Plasma Functionalisation Technology

At the core of all our product offerings and underpinning the Group's future nanomaterial prospects, is Haydale's patented HDPlas[®] plasma functionalisation process which improves the dispersibility of many nanomaterials by changing their surface chemistry using a highly tunable, repeatable process. Plasma functionalisation allows Haydale to tailor advanced materials to enhance the properties of its customers' products to achieve pre-agreed mechanical or conductive performance criteria. The process is cost effective and environmentally friendly and our capacity to produce industrial levels of functionalised nanomaterials underpins the business model. Specifically, we have the expertise to:

- functionalise nanomaterials that are blended with resins, composites and fluids to deliver enhanced electrical, mechanical (strength) and thermal performance;
- formulate proprietary nanomaterial-based inks and coatings for the print and sensor markets, including biomedical, RFID and piezo resistive inks and sensors; and
- compound functionalised nanomaterials into a range of elastomers to enable customers to use nanomaterials in elastomeric products.

The Group safeguards its nanomaterials business across its sites and the territories in which it operates through the use of patents and trade secret protocols which protect its intellectual property. It holds licences where that intellectual property is for operational reasons with a third party. Haydale currently has a portfolio of patents that are variously recognised in the following territories – US, UK, Europe, China, Japan and Australia. Haydale works closely with its patent advisors, Mewburn Ellis LLP, and maintains a rolling programme of patent applications.

Plasma Functionalised Powder Sales

We have secured a number of commercial contracts during the year with manufacturers of graphene to plasma functionalise their graphene powders to their requirements and are in discussions with many others who recognise the difference plasma functionalisation can make.

Of particular note, we have entered into contracts with a number of major industrial customers who manufacture their own nanomaterials. For Saint Gobain, who manufacture boron nitride, we are working with their end customers to hone the final surface chemistry to match their desired outcomes. Our ability to reliably adjust the surface chemistry has more recently led to our securing a major collaboration with Petronas to help them take their own graphene product, refined from a byproduct of their main petrochemical business, and functionalise it so it can potentially be recycled into other applications. We anticipate that these initiatives may lead to significant volumes needing to be plasma functionalised over the coming years, either directly by Haydale, or indirectly through the leasing of plasma reactors on a volume based royalty model.

Plasma Functionalised Products Sales:

Heating

Haydale has been working in the energy and heating sectors for a number of years. Geopolitical events and the UK Government's net zero strategy, have brought an increased urgency for solutions in this space.

Over the past few years, the Company has developed a number of off-the-shelf flexible heater graphene-based functional inks that can be printed onto a wide variety of surfaces. Based on those inks we are developing a range of low power heating products, potentially the most exciting of which is an energy efficient, cost-effective and easy to install underfloor heating system that could be used to supplement or replace domestic heating systems. The technology could be rolled out underneath the floor covering (e.g. carpet or tiles) and potentially run off a battery. With support from the Welsh Government, working prototypes have been created and are currently being tested in laboratory conditions to finalise the design before further optimisation and seeking a CE mark. We are now looking at various partnership options to take these to market.

We are also undertaking a number of paid projects for Cadent focused on helping energy suppliers meet their obligations to their vulnerable customers where they are under a legal requirement to be able to guarantee hot water and heating in situations where the power or gas go down. The initial project referred to last year involves a portable, battery powered water heater, a prototype of which is currently undergoing testing. We have also recently started work on a low power, portable over-the-radiator heating device which is also looking promising. Other potential applications of the same low power heating technology are currently in early-stage testing with partners.

In FY22 we announced we were working with a company that had acquired a patent for a boron nitride based thermal fluid. This has not progressed as we had hoped and is unlikely to lead to further revenues. We have however developed our own graphene based thermal fluid (patent pending) which early trials suggest performs with similarly positive thermal results and have now partnered with a specialist heating fluid engineering firm to finesse the formulation to work with the necessary additives so it meets applicable industry standards and can ultimately be deployed into their customer base.

Sensors

Following on from the work historically undertaken in the biomedical ink sector, we have a range of off-the-shelf functional inks appropriate for use in biomedical and other sensor applications that can potentially detect a wide range of medical conditions. These inks have a high sensitivity and are therefore able to replace lower grade carbon inks and potentially metallic based inks in existing sensor products. Our work with a leader in the glucose monitoring and diabetes management sector is moving forwards following positive results against their existing inks and, having successfully passed an audit of the quality controls around production at our Ammanford site, we are now working with them on further tests. In the interim, we are separately working with a major European sensor manufacturer on a sensor product application to detect chlorine in water which we understand has a potentially lower barrier to entry, market wise.

Elastomers

Our collaboration with Vittoria Spa, a leading premium cycle tyre manufacturer, has progressed and, having proved the benefits that plasma functionalised graphene can bring to tyres (namely: grip, rolling resistance, puncture resistance and durability), we are shipping tonnage materials. We are also working with Vittoria on further enhancements for the next generation of tyres and anticipate the existing graphene enhancements to start trickling out to the wider market in due course.

Composites

In the second half of FY23, we released a graphene enhanced prepreg tooling material, following two years of trialling with Prodrive Composites Ltd, which is designed to deliver cost

effective composite tooling with extended tooling life. This, and related products which were released during the year, are now seeing interest from the market which we hope will build through the current year.

Focused research and development

We continue to work on customer-paid and grant-funded projects to develop plasma functionalised nanomaterial solutions where there is a clear problem statement and we believe there to be a volume demand at the end of the process for any product created. We are selective and require a clear business case to proceed. By being able to deliver a number of selective projects that have resulted in a requirement for plasma functionalised material for third party applications or intellectual property that vests in Haydale, we have been able to build our underlying customer base. Key projects include the development of material that might be appropriate for type IV and V hydrogen storage tanks with Viritech for use in hydrogen powered vehicles and anti-counterfeiting technology using our PATit plasma functionalised graphene based conductive inks.

Asia Pacific

The performance of both the Thailand and Korea operations were at the lower end of expectation and, whilst we have been able to leverage our presence in these countries to secure several major clients for the Group as a whole including Petronas and Vittoria sourced by the Thailand office, it has been agreed that both entities are to be scaled back to a sales front office for the foreseeable future. This has been a progressive process which we will continue to monitor carefully. The Korea office concluded a beneficial commercial settlement with iCraft to terminate the agreement after they decided to focus on their core activities.

SILICON CARBIDE POWDERS AND TOOLING

Following prior year investment in the US and our move up the value chain into the manufacture of cutting tools, we have seen our silicon carbide and tooling business achieve significant growth in FY23. Although the raw SiC powder market is limited in scope (historically dependent on a small number of key customers) we continue to have additional sales in that area.

The sale of SiC cutting tools is, by itself, a \$900m market. Having previously invested in the necessary plant to manufacture our own SiC tooling and signed finishing service supply agreements to ensure we can meet capacity demands, towards the end of FY23 we released our first cutting tools catalogue and appointed four additional regional manufacturer representatives who act to introduce our product directly to end users on a commission only basis and thereby cost effectively extend our sales reach. The initial feedback we are receiving is very positive and we understand our tooling is exceeding the largest competitor in terms of durability and performance in a number of applications. This is starting to lead to a potential sizeable demand for product being reported by the manufacturer representatives which we anticipate will feed through into orders in the US, hence we are

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taking steps to ensure inventory is available to support. We have recently secured an agreement with a distributor for the UK and Ireland and are in discussions for similar arrangements in East Asia. In addition, we have started acting as a seller of complementary non-SiC tooling in a number of areas and are also looking to develop further partnerships in this space through FY24.

Other products

There has been limited progress on CeramycGuard™, a one stop solution to significantly extend the surface life of concrete assets, for which Haydale holds the distribution rights for the UK market. Whilst accreditation with the Drinking Water Inspectorate (“DWI”) has not been progressed due to the DWI not having the necessary capability at this time, we still believe that there remains a key market in the wider, non-drinking water market.

PRODUCTION CAPACITY

Haydale invested in production capacity for its plasma functionalisation process and ink production in FY22 and now has sufficient capacity to meet its forecasts for the next few years. Should additional capacity be required, Haydale has a scaling plan to affordably and materially increase its own internal capacity on relatively short timescales or, depending on client volumes, arrange for a machine to be leased to a client and charge a volume based royalty.

Likewise, there is also more than sufficient capacity for the manufacture of SiC powder and tooling in the US to meet the business plan for the next few years.

OVERHEADS

The Directors continued to invest in the human capital across the wider business in FY23, strengthening the teams across UK and US operations across the spectrum of sales, marketing, human resources, quality control and production. Whilst there will be further strategic hires required at the right time to manage the anticipated growth, there is not expected to be a need for any step change to deliver the business plan.

At the same time, the Group has also taken selective measures to reduce costs around the organisation. The scope of these is being extended as more focus is brought into the areas likely to lead to profit on a short-term basis.

FUTURE STRATEGIC DIRECTION

As noted above, the US operations have potential for strong growth in the short term through the manufacture and sale of specialised SiC tooling and complementary products. Having historically made the necessary capital investments, the focus is now on building the manufacturing representative network across the US and elsewhere to get the tooling into key end user sites.

Whilst Haydale has world leading technology for the functionalisation of nanomaterials, the focus for the UK is on

building the business partnerships that will get its plasma functionalised nanomaterial solutions into the market and the organic growth that this will bring through repeat revenues at scale. This is concurrent to developing our own strategic products based on our existing solutions, such as underfloor heating, and we anticipate these, together with third party plasma functionalisation services, will form the basis of our future growth over the coming years in the UK.

The Directors remain mindful of the scaling challenges in both the US and UK that need to be managed for the Company to deliver the growth it expects to deliver as its early-stage industry partner relationships develop.

FINANCIAL REVIEW

The Financial Review should be read in conjunction with the consolidated financial statements of the Group and the notes thereto. The consolidated financial statements are presented under International Financial Reporting Standards and are set out on pages 27 to 60. The financial statements of the Company continue to be prepared in accordance with FRS 101 and are set out on pages 61 to 67.

Statement of Comprehensive Income

In the year under review, the Group’s principal areas of income were sales of specialty inks, fluids and graphene enhanced composites and associated consultancy services from the UK and APAC operations and sale of SiC fibres, whiskers, particulate, blanks and tooling from the US operation. The Group’s revenue for the year ended 30 June 2023 of £4.30 million (FY22: £2.90 million) represents a 48% increase compared with the previous year. Revenue derived from product sales increased by £1.33 million during the year, driven by the US business performance (See note 4, Segmentation Analysis).

The Group’s Gross Profit, which excludes Other Operating Income, was £2.39 million (FY22: £1.75 million) delivering a Gross Profit margin of 56% (FY22: 60%) which is slightly down due to sales mix.

Other operating income, which is principally grant funded projects, was £0.38 million (FY22: £0.44 million) consistent with prior year after taking account of £0.06 million received in FY22 from US Covid Government Support packages.

Adjusted administrative expenses increased by £0.74 million (13.4%) to £6.26 million (FY22: £5.52 million) reflecting the full year impact of investment decisions taken in FY22 partially offset by cost savings resulting in an adjusted operating loss of £3.49 million (FY22: £3.33 million). Total administrative expenses for the year were £8.93 million (FY22: £7.24 million) which, in addition to the above, reflects additional non-cash related share-based payment expenses of £0.55 million. Also, the Group took the decision to impair the fixed assets held in the US and accordingly a non-cash charge of £0.53 million is included in total administrative expenses.

The Loss from Operations was £6.17 million (FY22: £5.06 million). Finance costs, which include interest payable on the Group's debt, for the year were £0.41 million (FY22: £0.19 million).

The Group continued to direct resources to research and development with the focus for that investment on products and processes that could develop into sustainable and profitable revenue streams. R&D spend for the year was £1.52 million (FY22: £1.45 million¹), of which £0.42 million was capitalized (FY22: £0.34 million). During the year the Group claimed R&D tax credits of £0.40 million (FY22: £0.43 million) and it is expected that this claim will be received during the current financial year.

Total comprehensive loss for the year, including £1.12 million (FY22: £0.41 million) of one off charges relating to impairment of tangible assets and share-based payment costs, was £5.80 million (FY22: £4.54 million).

The loss per share for the year was £0.01 loss (FY22: £0.01 loss).

Statement of Financial Position and Cashflows

As at 30 June 2023, net assets amounted to £6.97 million (2022: £7.05 million), including cash balances of £1.38 million (2022: £1.19 million). Other current assets marginally decreased to £3.15 million at the year-end (2022: £3.26 million) with modest reductions across most areas offset by an increase in inventory of £0.22 million at the US facility during the year. Current liabilities reduced slightly to £2.01 million (2022: £2.28 million) principally due to a reduction in trade and other payables.

The Right of Use Asset in respect of its leased premises decreased to £2.20 million (FY22: £2.70 million) due to winding down of the leases agreements. The Lease Liability which is split between Current and Non-Current Liabilities similarly decreased to £2.44 million (FY22: £2.92 million). These movements were non-cash items and did not impact the cash outflow in the year. The Company will amortise these balances over the remaining life of the leases which varies across the sites.

The Group's US Pension Obligations of £0.58 million (FY22: £1.36 million) has reduced in the year due to a combination of positive movements on investments, exchange and discount rate movements and contributions made.

Net cash outflow from operating activities before working capital movements for the year increased to £3.67 million (FY22: £3.42 million), the principal contributing factors being the Loss after Taxation of £6.17 million (FY22: £4.81 million). Cash used in Operations increased by £0.92 million in the year to £4.09 million (FY22: £3.17 million). The Group received an R&D tax credit inflow of £0.43 million in the year (FY22: £0.37 million). Net cash used in operating activities increased to £3.66 million (FY22: £2.80 million).

Capital expenditure in the year, excluding the IFRS 16 adjustments, was £0.20 million (FY22: £1.00 million).

Capital Structure and Funding

On 13 September 2022, the Company raised £5.51 million (gross) through the placing, open offer and subscription of 275,516,784 new Ordinary Shares at 2.00 pence per share. Consequently, at 30 June 2023 the Company had 785,852,475 ordinary shares in issue (2022: 510,335,691). No options were exercised into ordinary shares during the year (FY22: Nil).

The Group's total borrowings at the year-end were £1.37 million (2022: £1.35 million), of which £1.21 million was in the UK and the balance in the Group's US subsidiaries. The UKRI Innovation loan has a quarterly liquidity covenant until April 2024 with which the Group has been in full compliance through the reporting period. There are no financial covenants extant in respect of the UK bounceback loan of £0.03 million (FY22: £0.04 million) or the Group's US borrowings.

Post Balance Sheet Event

On 3 October 2023, the Company raised £5.1 million (gross) through a placing, retail offer and subscription of 1,012,609,000 new Ordinary Shares at 0.5 pence per share. The funds raised will be principally used to fund the general working capital needs of the business. As part of this process, the Company's share capital was restructured to in effect reduce the nominal value of each ordinary share from 2.0 pence to 0.1 pence.

Save for 576 shares issued following an exercise of warrants, all other warrants issued following the fundraise on 13 September 2022 of 138,758,392 lapsed on 14 September 2023 and are no longer exercisable.

Key Performance indicators

The Group has historically reported financial metrics of revenues, gross profit margin, adjusted operating loss, cash position and other metrics as its key performance indicators and these are set out below.

	FY23 (£m)	FY22 (£m)
Revenue	4.30	2.90
Gross profit margin	56%	60%
Adjusted operating loss	(3.49)	(3.33)
Cash position	1.38	1.19
Borrowings	(1.37)	(1.35)

During the year under review, management also used a sales tracker, a non-financial performance metric to monitor the revenue pipeline of the business. The sales tracker monitors the number of accredited leads and assigns a probability of revenue realisation to those leads.

¹ Based on calculations submitted to HMRC for the R&D tax credit.

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SECTION 172(1) STATEMENT

The Directors acknowledge their duty under s.172 of the Companies Act 2006 (“s.172”) and consider that they have both individually and together acted in the way that, in good faith, would be most likely to promote the success of the Company for the benefit of its members as a whole, having regard to the matters set out in s.172.

The Directors have set out the ways in which they look to fulfil their duties in the year at section 3 of the Chair’s Corporate Governance Statement on page 13 to 14.

PRINCIPAL RISKS AND UNCERTAINTIES

The Board considers that the principal risks and uncertainties facing the Group may be summarised as follows:

Health and Safety

Many of the Group’s products are advanced materials that are nano in size and, although there is little actual evidence of any health risks associated with the handling of the Group’s products, there is a theoretical risk that the Group’s products could be a danger to health if an individual is exposed to and/or inhales/ingests some of the Group’s products. The Group takes health and safety very seriously and manages the potential health and safety risk by regular staff training, well maintained facilities and restricting activities to only certain qualified individuals. The UK facilities are ISO 9001 and ISO 14001 accredited and the Thailand facility has ISO 9001 accreditation. A detailed health and safety report is provided to the Board each month and is a standing agenda item at scheduled Board meetings.

Timely Adoption of the Group’s Products

While the Group makes every effort to establish realistic timelines for customer engagement, testing and purchasing of Haydale’s products, there are often unforeseen delays (by both parties) in forecasting the commencement of sales. There may be regulatory hurdles to overcome and end-customer risk aversion in accepting a new nanomaterial enhanced product or other competitive considerations. The focus on commercial product sales remains an absolute priority, notwithstanding that the timing and adoption of Haydale’s newly developed product lines remains difficult to predict.

Intellectual Property Risk

The Group’s success will depend in part on its ability to continue to innovate to keep itself ahead of the competition, especially in and around plasma functionalisation, and maintain adequate protection of its resulting IP portfolio, covering its manufacturing process, additional processes, products and applications. The IP on which the Group’s business is based is a combination of granted patents, patent applications and confidential know-how.

Internal procedures and controls are in place to capture and exploit all generated IP as well as to protect, limit and control disclosure to third parties and partners. The Group aims to

mitigate any risk that any of the Group’s patents will not be held valid if challenged, or that third parties will claim rights in, or ownership of, the patents and other proprietary rights held by the Group through general vigilance, regular international IP searches as well as monitoring activities and regulations for developments in copyright/intellectual property law and enforcement. The Group retains third party professional experts to advise and assist on all matters relating to IP.

Information and Communications Technology (“ICT”) Risk

The inability to access data for a period of time either due to systems failures or the unauthorised intervention of malicious parties may severely impact the Group’s ability to conduct its day-to-day business, lead to the loss of sensitive information or result in loss of funds in a ransomware attack.

The Group aims to mitigate these threats by maintaining a third-party ICT support agreement with a respected contractor, ensuring industry standard cyber security procedures are followed, setting out clear internal procedures for communicating potential ICT breaches and by providing adequate staff training on the cyber security risk that all users face. In the event that these procedures are inadequate the Group maintains a business continuity plan with our service provider that covers longer term denial of access.

Dependence on Key Personnel

The Group’s business, development and prospects are dependent upon the continued services and performance of its Directors and other key executives. The experience of the Group’s personnel helps provide the Group with a competitive advantage. The Directors believe that the loss of services of any existing key executives, for any reason, or failure to attract and retain necessary additional personnel, could adversely impact on the business, development, financial condition, results of operations and prospects of the Group. The Group aims to mitigate this risk by providing well-structured and competitive reward and benefit packages that allow it to attract and retain key employees.

Financing Risk

Until such time as the Group is profitable and cash flow generative, it will periodically need to raise additional funding to cover its ongoing working capital needs. The Group may be unable to access additional debt or equity capital or to raise funds on acceptable terms. In the event that the resources available to the Group are insufficient then this could have a materially adverse impact on the implementation of the Group’s strategy, operations and financial status. The Group mitigates this risk by active engagement with its major shareholders, advisers and bankers.

By order of the Board

David Banks

Chair

25 October 2023