

# Strategic Report

The directors present their Strategic Report for the year-ended 30 June 2021.

## PRINCIPAL ACTIVITIES

Haydale brings together the cutting-edge technology of the patented HDPlas® process with our engineering expertise to functionalise graphene and other nanomaterials. Our technology has the potential to deliver benefits across a multitude of sectors helping to increase the technical performance of a wide range of host materials. The Group's mission is to use our knowledge of advanced materials and dispersion to be one of the world's foremost creators of material change, enabling our customers to improve the performance of their products. The Directors believe the Company is well placed to be in the forefront of nano advanced materials and dispersion and to become a world leader in the creation of material change through understanding the potential of those materials.

Whilst the majority of the Group's revenues to date have been generated by our US operation, at the core of our product offering and underpinning the Group's future prospects and value, is Haydale's patented HDPlas® functionalisation process which improves the dispersibility of some inert nanomaterials. Functionalisation allows Haydale to tailor advanced materials to enhance the properties of our customers' products. The process is cost effective and environmentally friendly and our capacity

to produce commercial levels of functionalised nanomaterials underpins our business model and sets us apart from our direct competition in this space. Specifically, we have the engineering expertise to:

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

Our US facility is projected to be our bridgehead into the dynamic North American market for our technology. We also manufacture unique, proprietary silicon carbide ("SiC") fibres and whiskers that strengthen ceramics and produce highly wear resistant ceramic 'blanks' for use in the aerospace industry and for abrasion resistant coatings.

At the 30 June 2021, the Group has the following operational activities in its five facilities.

Haydale subsidiary	Location	Principal activities
Haydale Limited	Ammanford, Wales	Specialist functionalisation and main manufacturing facility producing inks, resins, 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 and other nanomaterials and the provision of advanced consulting and test services to various parties including the EU and UK national institutions via R&D grants.
Haydale Technologies (Korea) Limited ("HTK")	Seoul, South Korea	Dedicated sales office servicing the fast-moving Korean and other APAC markets.
Haydale Technologies (Thailand) Company Limited ("HTT")	Bangkok, Thailand	Ink and masterbatch development focused on commercial applications with plasma functionalisation facilities. Services the APAC region.
Haydale Technologies, Inc. ("HTI") and its wholly owned subsidiary Haydale Ceramic Technologies LLC	Greer, SC, USA	Sales office servicing the North American market, developing the European and Chinese markets and manufactures and sells SiC microfibres and whiskers, ceramic blends and ceramic blanks to the cutting tool and coatings industries

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The Group safeguards its nanomaterials business across these sites and the territories in which it operates through the use of patents 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. In the past year the Company has had four patents granted across three different patent families including a patent in the US for clothing incorporating a printed heater incorporating graphene ink, one application has been allowed and is close to grant and four new applications have been filed.

## REVENUE MODEL

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

- Sale of plasma reactors with appropriate licencing for use of the patented HDPlas® functionalisation process;
- Sale of functionalised material in powder, masterbatch or pre-preg format;
- Sale of SiC microfibres and whiskers, ceramic blends and ceramic blanks to the aerospace cutting tool and coatings industries;
- Sale of own brand and third-party products which clearly align with our product or customer base; and
- Consultancy work with respect to testing the potential enhancements that our product range and engineering acumen may bring to customer applications.

## COMMERCIAL OPERATIONS

The financial year-ended 30 June 2021 ("FY21") has taken place against the backdrop of the Covid-19 pandemic which, whilst restraining revenue, has acted as a catalyst to further deliver on the strategic priorities that the Company has previously set out. Notwithstanding the challenges raised by the pandemic in several of our key markets, the Group has delivered a resilient performance in the year and, by focussing on elements within our control, made solid strategic progress towards the Group's commercial goals.

The Group continues to transform itself from a research and development organisation to a manufacturing business focussed on commercialising its portfolio of technology and securing profitable outcomes. During the year the Company has ordered a larger plasma reactor and ancillary equipment that should deliver a significant increase in our functionalisation capacity and provide the tools to move production to an industrial level.

## UK & EUROPE

One of the early ramifications of the UK's response to Covid-19 was the temporary closure of both commercial and academic research facilities. However, despite the unfamiliar challenges of collaborating during the UK's and other territories lockdowns, we experienced an increased appetite from existing and new customers to investigate the benefits that our nanomaterial science can bring to their products, and we saw an acceleration in both serious enquiries and the commencement of new commercial projects during the latter part of the year.

The UK division made meaningful progress towards commercialising its proprietary technology. Functionalised product sales increased by 30% over the prior year and project and other consultancy revenues (excluding reactor sales) grew by 122% on a like for like basis. This increase judged alongside the sales pipeline gives ground for cautious optimism that, despite the impact of the pandemic and the knock-on effects as Government stimulus programmes are unwound, momentum will be maintained.

## Sales & Consultancy Work

In March 2020 Haydale announced that it would be cooperating with the English Institute of Sport ("EIS") and the Welsh Centre for Printing and Coating ("WCPC") to deliver a range of advanced wearable technology sport apparel for elite athletes. The initial plan had been to produce performance garments for a range of sports in readiness for the Tokyo Olympic Games in 2020. The project was put on hold with the delay in the Games but, in combination with the other supply chain partners, Haydale delivered garments to several Team GB competitors for use at the rescheduled Games. The garments benefit from temperature regulated panels, designed using Haydale's printed functionalised graphene ink, and the Group is now in discussions with a potential customer who can access the wider commercial market.

The four-year agreement with DLYB<sup>1</sup>, which commenced in April 2020, allows them to market Haydale's electrically conductive graphene-enhanced masterbatch in China and Taiwan. The first year of the contract was reserved for product validation and whilst these tests have taken longer than scheduled, results continue to be encouraging and, although some issues persist, we are hopeful of moving to the commercial phase of the contract during 2022. Although this is later than anticipated, it is not unusual for the move from research and development to wider commercial adoption of cutting-edge technology to take longer than predicted.

In December 2020 we secured our first sale to Bolflex of our functionalised nano-enhanced rubber masterbatch for use in its premium shoe range. The masterbatch is incorporated into the

<sup>1</sup> Dalian YiBang Technology Company Limited ("DLYB") has been at the forefront of introducing and servicing high-end imported products for 15 years in China, which included the introduction of copper mesh for the purpose of lightning strike protection in both aerospace and wind energy sectors.

styrene-butadiene rubber compound used in its soles and results show improvements against its footwear test standards with increased tear strength and enhanced abrasion, flex and slip resistance. Subsequent to this announcement, the Company has been engaged by several companies in the premium leisure footwear market and is actively working on feasibility studies to demonstrate that our functionalised masterbatches offer performance enhancement and a reduced environmental footprint. Post year-end Haydale has filed for further patent protection in this area.

Haydale's work with Briggs Automotive Company continues with the use of our graphene enhanced composites for several of the body panels and for parts of the tooling line. We were delighted to see that the BAC Mono R won the Track Car of the Year Award at the prestigious 2021 GQ Car Awards and it is a privilege to be part of the wider team that is delivering this exceptional car.

Haydale signed an agreement with Dowty Propellers ("Dowty") in September 2020 for the provision of services for the collaborative development of graphene and nanomaterial enhanced products for use in Dowty products. The main body of work completed during the year and, whilst the results were positive, they did not demonstrate the specific step change in performance hoped for at this stage. The parties may look at further projects related to the work performed but these are unlikely to commence until 2022.

#### *Sale of Plasma Reactors*

In April 2021 Haydale partnered with 401 Tech Bridge, Rhode Island, US, to provide a HT200 Plasma Reactor and advanced materials support for their innovation ecosystem. The HT200 Plasma Reactor will be utilised in the 401 Tech Bridge Advanced Materials and Technology Center, managed by the University of Rhode Island (URI), to support its ambition to accelerate the commercial adoption of new materials and support local companies' efforts in developing next generation products.

This was the first sale of a plasma reactor since the year-ended June 2019 and was in response to growing interest in the functionalisation capabilities of our patented HDPlas® reactors. The Directors appraise each approach on its merits with the guiding tenet that reactor sales must be demonstrably in the long-term interests of the Company.

#### *Collaboration Agreement with ProMake Limited ("ProMake")*

ProMake specialises in design, development and manufacturing of medical innovations and devices. In November 2020 Haydale signed a memorandum of understanding with ProMake to formalise the collaboration on, amongst other areas, conductive and piezo resistive inks and SynerG supertough and conductive

PLA 3D printing filament. Haydale also supported ProMake's submissions for Lot 2 and Lot 4 of the Public Health England ("PHE") National Microbiology Framework announced in November 2020. In April 2021 PHE announced that ProMake was one of the successful bidders for both Lots. In July 2021 the parties signed a new collaboration agreement for Haydale to be the exclusive supplier of the graphene and other nanomaterials required for the effective functioning of ProMake's BioPod, a reusable biosensor device, and also set out Haydale's responsibility for the manufacturing supply of several elements of their PreVent testing device, which could also potentially utilise the anti-bacterial qualities of functionalised graphene as one of its components.

The Directors are keen to have the opportunity to directly assist in the fight against Covid-19, but given the uncertainty inherent in contracts of this nature and scale, the Directors are taking a prudent approach to their investment of time and resource at the present time.

#### *ASIA PACIFIC*

Our APAC hub in Thailand and sales office in South Korea continued to make solid progress in the year towards commercialising Haydale's proprietary technology. The three-year exclusive agreement with iCraft<sup>2</sup>, to supply six tonnes of functionalised graphene for cosmetic face mask sheets announced in September 2020 was ahead of schedule at the year end. Haydale shipped 2.2 tonnes in FY21 against a one tonne commitment and this may lead to slightly lower volumes in FY22 as the volumes rebalance back to the contractual requirements. We are also working closely with iCraft to supply functionalised graphene powder for the manufacture of their graphene nano platelet enhanced, anti-bacterial, neoprene PPE face masks. As part of the on-going collaboration between the parties a sole distributor agreement covering the UK and Europe was concluded in December 2020 and the first direct-to-consumer sales of iCraft's PPE face masks were secured in January 2021 from Haydale's UK web portal. Whilst sales of PPE face masks have not met our initial expectations, we believe that highlighting the positive anti-bacterial and other properties of graphene within wearable garments will be of value in the medium term.

Haydale has continued to work with IRPC<sup>3</sup> and has been engaged on several projects during the year, including the Phase II agreement for the development of transparent graphene and functionalized acetylene black conductive inks for RFID, NFC and related applications. Our operation has also forged new contacts within the Thai industrial landscape and is actively collaborating with a number of well-known international operations who have shown interest in the potential applications of our product range.

<sup>2</sup> iCraft, based in South Korea, is a global technology company with interests in security and network solutions as well as the health and beauty sector

<sup>3</sup> IRPC Public Company Limited ("IRPC") is a Thai Public SET-listed Petroleum and Petrochemical company. It is a subsidiary of PTT Group,

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Notwithstanding this progress, APAC revenue in H2 FY21 was below our expectations. In order to take advantage of the commercial opportunities available, in May 2021 we appointed our first Director of Sales in Thailand who came with a strong background in speciality polymer formulations. We are already seeing the benefits of the focus and experience that this role brings to our operations.

## NORTH AMERICA

From March 2020, Covid-19 had a significant impact on forecast revenues at this division and we saw a marked slowdown in demand for SiC and blanks in the last quarter of FY20 and during FY21. The global aviation industry remained grounded by the pandemic for the majority of this reporting period, but towards the latter end of the year, we observed some signs of a recovery in business aviation and domestic flying activity and, whilst the pace of this recovery and the speed with which it will filter through the jet engine supply chain is uncertain, we did see a small increase in sales of our ceramic blanks during H2 FY21.

Historically this division has been dependent on SiC whisker sales to two long term customers and we have seen very different outcomes from these customers during the year. The business received a commitment from its largest customer to underpin the SiC whisker volume by increasing its short-term order patterns during FY21 despite the economic uncertainty and muted demand. The support we have received this year has ameliorated some of the short-term impact of Covid-19 but will result in significantly reduced orders in the year-ending June 2022. Importantly this assistance has offered the business unit valuable breathing space to deliver on the initiatives detailed below. Unfortunately, we did not receive similar support from our second largest whisker customer and, towards the latter part of the year, we regrettably had to seek legal intervention to try to secure fulfilment of their FY21 revenue obligations of circa £450,000 and at this time the matter is scheduled for an arbitration hearing in 2022.

As the impact of the pandemic became clearer, the Directors took defensive measures to reduce the overhead base at the US facility and sought assistance from widely available US federal stimulus programmes. The leaner cost base mitigated some of the immediate revenue impact of the pandemic, but the Directors recognised the need to reduce reliance on the US civilian aviation sector and to widen the unit's product offering and expand its geographical footprint. Specifically, the Group identified the European and the Far Eastern cutting tools market for sales of both SiC whisker and blanks. We are pleased to report that these plans had a positive impact on results at this business unit during FY21 and provides a more robust foundation for this business to move forward in the current financial year.

## European Blanks Sales

In January 2021 we employed an experienced European agent for the marketing and sale of SiC blanks into parts of the European market and other contiguous markets. Subsequent to his employment, we commissioned third party benchmarking tests at the University of Zwickau to ensure we were able to match or exceed the quality of finished cutting tools sold by our competitors in the exacting European market. Positive test results provided assurance to potential European cutting tool customers and several are looking to conduct internal trials on our blanks. In an adjoining market we achieved our first blanks sale outside of the North American market and, whilst challenges remain we anticipate this business will expand in the next financial year. Despite positive initial contacts with a UK engineering tooling supplier for the distribution of blanks, at this stage we have been unable to secure any meaningful business in the UK market.

## Far Eastern Sales

The Company signed a Memorandum of Understanding ("MoU") with a Sino-UK facilitator in FY20 and the early promise shown by this relationship is now being fulfilled. Further to this MoU, in January 2021 Haydale announced an Agreement with Qinhuangdao ENO High-Tech Material Development Co., Ltd ("ENO") which allows it to act as a sales representative for Haydale's ceramic and silicon carbide products in China (including Hong Kong) and Taiwan for an initial period of two years ending December 2022. Under the Agreement, ENO expected to buy a minimum of \$300,000 of product from Haydale within the first year of the agreement but sales have been slower than anticipated with the pandemic having a similar impact on demand as we have seen in our other markets. Haydale has secured sales to a further four companies in China during the year and is also actively collaborating on several other projects in China which would extend our market penetration. We remain encouraged by the strong interest in our SiC whisker and blanks offering and, notwithstanding the residual effects of Covid-19, anticipate revenue growing in this area in the current year.

## Product Diversification

The Company has also diversified beyond the aviation and cutting tools sector and has looked to take advantage of the enhanced properties that SiC microfibres can deliver for surface bonding technology applications. In July 2020, Haydale was appointed the exclusive distributor to the UK water infrastructure market for US based Zirconia Inc for CeramycGuard™<sup>4</sup>. In April 2021 the Company signed an amended agreement that extended the term from 31 December 2023 to 31 December 2030 and allowed Haydale full distribution rights of CeramycGuard™ across all sectors in the UK. Furthermore, with authorisation, Haydale may now also distribute to additional territories outside of the US, for all markets and sectors.

<sup>4</sup> Previously CeramycShield™



CeramycGuard™ is a one stop solution that can be used in new concrete applications and also renews and restores old or partly decaying concrete in-situ in certain applications as well as preventing water loss. This product is an advanced Ceramic Surface Treatment technology in a new class of inorganic ceramic polymers, that uses Haydale's SiC microfibre as part of the reinforcement. Haydale is working closely with a number of UK water utilities, other water facility management companies and more general civil engineering contractors who require a solution to concrete degradation. During the year we secured our first sale of the product to a UK water utility and in February 2021 Biwater positively trialled CeramycGuard™ at its wastewater treatment site in Managua, Nicaragua. We believe there is good potential that this cutting-edge solution could be very important to the UK water industry as it seeks to meet its obligations under the new AMP-7 five-year plan which started in 2020. We are currently working to secure DW31 (Clean Water) accreditation in order to significantly increase the scope of its potential applications.

Haydale has been looking to enter the wider carbide tooling market with cost effective lower grade SiC blanks that would serve the automotive and other cutting tool markets. Our supply partner is still to overcome the operational challenges involved in scaling production to required commercial levels. We continue to work to surmount these issues but at the present time we are not anticipating any revenue from these lower grade tools.

#### FOCUSSED R&D INVESTMENT

The HDPlas® functionalisation process continues to be the cornerstone of the Group's offering underpinning its future growth prospects. During the year, good progress has been made with several new and different treatments enabling more tuneable and enhanced offerings to meet customers' requirements. This manipulation enables a much greater range of graphene and other nanomaterial treatments and facilitates potential improvements in dispersal and mechanical strength, electrical conductivity and thermal conductivity. During the year we have seen demand for the functionalisation of other nanomaterials accelerate and in particular for treated Boron Nitride. Boron Nitride shares many of the same properties as graphene and is commonly known as white graphite. When used as a lubricant additive it provides a low coefficient of friction, enhanced wear and high thermal conductivity for more efficient heat dissipation from moving parts to prevent seizure. Haydale has been engaged to functionalise Boron Nitride to improve its dispersibility. Amongst other developments, Haydale has:

- Developed advanced nano enhanced SynerG SuperTough 3D filament, improving the tensile strength by circa 25%, the strain failure by 45% and the thermal conductivity by a factor of 3. Haydale also developed SynerG Conductive PLA 3D Printing Filament, with electrical conductivity in the range of  $4.5E+04$  to  $4.7E+05 \Omega.cm$  as well as a 30% increase in strength and a 3-fold increase in thermal conductivity. We anticipate growing sales in the additive printing sector in FY22.

- Developed next generation functionalised inks with resistivity reduced to under 10 ohms. This lower level resistivity potentially allows graphene functionalised inks to replace silver, copper and aluminium etch in certain metal antenna elements of the growing RFID and NFC sectors and provides a cost effective and environmentally friendly application. Existing 'tags' are generally single use and as such are consigned to landfill after use whilst Haydale functionalised inks are manufactured using a clean process and there is reduced waste to landfill on disposal; and
- Refined next generation functionalised biomedical sensor inks incorporating improved analyte detection through the incorporation of compatible functional groups to enhance the accuracy of diagnosis. The latest iteration has increased conductivity and electrochemical response and provides a cost effective and environmentally friendly alternative to traditional silver based printed biomedical sensor electrodes, which are also susceptible to tarnishing. The ink is being tested by a Far Eastern customer and we are also in discussion with customers in the UK.

The core thread running through our continued investment in R&D is the focus on creating and maintaining technological advantage where we see a clear commercial pathway. Whilst the gestation period for some of these developments, such as lightning strike protection on commercial aircraft, is defined by long product life cycles and mission critical safety thresholds, other developments such as creation of advanced additive printing PLA and the development of biosensor inks can be delivered to market in a much shorter time horizon. It remains core to our strategy that we invest for the long term whilst taking advantage of the numerous short-term commercial applications presented by our technology.

#### PATENT DEVELOPMENTS

Haydale safeguards the intellectual property that arises from its on-going investment in research and development through patent protection. The Company maintains a rolling programme of applications for both new inventions and also seeks to augment and extend existing patents by including later enhancements. Amongst other filings, the following are of special note:

- Joint Patent with Airbus – During the year the Group has collaborated with Airbus Operations Limited ("Airbus") on the filing of a joint patent for intellectual properties jointly developed by the parties under the multi-party NATEP-supported Graphene Composites Evaluated in Lightning Strike Project ("GraCELS-2"). In August 2021 Airbus filed the joint patent application. Further to the successful outcome of GraCELS 2, in October 2019, Haydale launched a range of graphene enhanced pre-preg material for lightning strike protection utilising functionalised nanomaterials to improve the electrical conductivity and reduce the unloaded weight of an airliner cost effectively and with clear environmental benefits. Haydale's capability in this area

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underpinned the DLYB agreement in early 2020 and the technology underlying the latest patent further enhances the effectiveness and performance of Haydale's pre-preg range of materials; and

- PATit™ – Haydale has been granted a European Patent for PATit™, its anti-counterfeit system which uses functionalised graphene elements incorporated into printing inks to create unique security and identity code patterns that are machine readable using capacitive touchscreen technologies. The code can be verified by using local or hosted software systems. Whilst the potential applications for PATit™ in the verification of OEM products and the fight against counterfeit goods are significant there are remaining technical and manufacturing challenges to wider integration in a product's security eco-system.

## GRANT FUNDED PROJECTS

Collaboration on grant funded projects has continued over the last twelve months with the continued emphasis that only projects that have a clear commercial pathway or add significantly to the Group's knowledge bank on applications are undertaken. Adopting this yardstick and prioritising commercial projects, reduced the number of grant funded projects that Haydale undertook in the year, but this has not diminished the importance of this work in support of the R&D investment made by Haydale. Grants received were from either UK or European quasi-governmental bodies and 'promoting the green economy' and 'cleantech' were the overarching themes for the funding awarded in the year. Haydale's involvement in several of these projects relates to its long-standing expertise in Hydrogen storage which has attracted renewed interest in the past 18 months. Amongst other projects awarded in the year, the following commenced:

- *Carbo4power* – a European consortium whose main objective is to develop a new generation of lightweight, high strength, multifunctional, digitalized multi-materials for offshore turbine rotor blades that will increase their operational performance and durability while reducing the cost of energy production, maintenance, and their environmental impact. This multi-year project complements previous development work on the NATEP funded GraCELS projects; and
- *Advance Propulsion Centre ("APC") Automotive Transformation Fund* – As part of this wide-ranging APC initiative tasked with exploring the feasibility of low carbon emission technologies, Haydale will assess the suitability of its promising lightweight, low-permeability storage tank, to help unlock the pathway to hydrogen propulsion. The feasibility study will assess the ability of Haydale's functionalised graphene enhanced materials to decrease manufacturing time and rejection rate, as well as to provide uplifts to permeability, toughness, and impact resistance.

This structured approach to development is facilitating the internal learning experience and creating potential products to fit with the organic growth momentum at the centre of our strategic drive.

During the year, amongst others, the Company successfully completed the Hibar Film and Affinity projects highlighted in last year's report and it has been encouraged to apply for further funds to develop the findings from the Hibar Film project.

## INCREASING PRODUCTION CAPACITY AT AMMANFORD

Haydale has consistently increased its capacity to functionalise graphene ahead of the production curve at its Ammanford facility. Prior investment permitted Haydale to meet the demands of its commercial commitments in FY21, especially in respect of demands placed by the iCraft cosmetic face sheet supply agreement. During the year the Group increased its investment at its main production facility and in particular:

- Ordered a new HT1400 HDPlas® reactor in May 2021 which will increase capacity eight-fold allowing the facility to functionalise over thirty tonnes per annum of graphene and other nanomaterials based on a single shift pattern. Whilst we do not foresee any significant technical challenges to the delivery of larger capacity reactors, we are not anticipating that the machine will be fully optimised until 2022.
- To support the production scale up, post year end we ordered, amongst other items, ancillary machinery to increase our mixing and powder handling capacity; and
- invested £0.05 million in a new gas delivery and piping system to reduce our production changeover times, enhance output consistency and to further improve on our exacting health and safety standards.

We anticipate that this investment which is spread over FY21 and FY22 will meet our production requirements for the foreseeable future in the UK and more importantly will allow us to significantly lower the cost performance ratio that has curtailed more widespread downstream adoption of graphene to date.

## REALIGNING AND REDUCING THE GROUP'S COST BASE

During the year, the Directors have continued to realign the cost base to ensure that the Group focuses its resources on achieving its strategic goals. As the Group has reorganised its operations and streamlined its reporting lines, it has achieved both a more efficient and effective operating structure and delivered significant cost savings. The process that started during FY19 continued during FY21 and adjusted like for like administrative expenses have reduced by a further £0.70 million (FY20: £0.87 million) in the year and by £2.4 million (31.4 %) since FY18.

The main savings have related to the reduction in the workforce with the principal savings being in the US operation which was

severely affected by the Covid-19 pandemic. Notwithstanding the overall reduction in headcount in the year we have, yet again, increased investment in sales resource and commercial support functions in the UK and Thailand. Outside of the workforce, continuing cost reductions across all areas of the business including sub-letting underutilised premises, reducing travel expenses, and making numerous smaller and, in themselves, non-material adjustments which taken together have contributed to controlling spend.

The savings secured have been achieved in a timely but not hurried timeframe and without doubt in areas such as travel and subsistence have been artificially reduced by the Covid-19 travel restrictions imposed by the relevant authorities. Whilst striving for a leaner cost base, the Company has focussed first on operational efficiency and then on achieving that in the most cost-effective manner. This approach has ensured that, despite the savings achieved, Haydale is now operating in a more flexible, responsive and productive manner that supports a can-do culture across the business units. Whilst our focus on cost control will not diminish, we anticipate in the coming year that overheads will marginally rise as we seek to meet the operational challenges of the sales pipeline.

During FY20 and to a lesser extent in FY21, the Company received limited support from the UK Government through the furlough scheme and from the US CARES Act via the Employee Retention Credit programme. The Company has had no UK employees on either full or part time furlough since October 2020.

### FUTURE STRATEGIC DIRECTIONS

Whilst the Covid-19 pandemic has undoubtedly depressed demand and subdued our revenue expectations for the year, it has not defined the Group's performance or slackened the progress towards our goals. Haydale has 39 verified Technical Data Sheets available (2018 – Nil) and has executed 38 commercial non-disclosure agreements since the start of the Covid-19 pandemic. The clear priority remains to commercialise our cutting-edge technology and the progress we have made during the year and the opportunities that we are seeing gives us confidence that we are on a steady path to more widespread adoption of our technology and the benefits, both performance and environmental, that it brings.

The Directors remain mindful that downside risks that could impinge on the general recovery persist, and the Group relies, amongst other factors, on the pace of recovery of the aerospace and more generally on the wider economy. However, the solid progress made in our core business during the year continues to reinforce the Directors' belief that, whilst navigating the new industrial landscape will remain challenging and forward momentum is unlikely to be smooth, the Company is moving in the right direction.

### 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 35 to 67. The financial statements of the Company continue to be prepared in accordance with FRS 101 and are set out on pages 68 to 74.

### Statement of Comprehensive Income

In the year under review, the Group's principal areas of income were sale of plasma reactors; SiC fibres, whiskers and blanks; Specialty Inks; and graphene enhanced composites. The Group's revenue for the year-ended 30 June 2021 of £2.90 million (FY20: 2.95 million), showed a small decrease of £0.05 million on that of the prior year. This reduction mainly reflected a fall in the North America and Asia Pacific business units which was not fully offset by gains in the UK business units.

Other operating income, which is principally grant funded projects, at £0.58 million (FY20: £0.76 million) is below historic levels which reflects the Company's move away from Grant funded to commercial projects. The Group received £0.14 million (FY20: £0.19 million) from the US Small Business Administration Paycheck Protection Programme ("PPP") and this is included in Other Operating Income.

The Group's Gross Profit, which excludes Other Operating Income declined marginally to £1.98 million (FY20: £2.06 million) delivering a Gross Profit margin of 68% (FY20: 70%).

The focus on reducing costs continued in the year and Adjusted Administrative Expenses fell by £0.63 million (11.8%) to £4.72 million (FY20: £5.36 million). On a pre IFRS 16 basis the comparable figures for Adjusted Administrative Expenses would have been £5.29 million (FY20: £5.99 million). Over the last three reporting periods the Company has reduced its operating cost base by £2.43 million. Pre IFRS 16 Adjusted administrative expenses exclude non-cash items such as share based payment charges, depreciation and amortisation as well as one-off restructuring costs but includes operating lease costs and, as such, gives visibility of the ongoing cash impact of our operating cost base. Total administrative expenses for the year were £6.11 million (FY20: £7.05 million).

The Loss from Operations was £3.56 million (FY20: £4.23 million). Finance costs, which include interest payable on the Group's debt, for the year were £0.21 million (FY20: £0.18 million).

The Group continued to direct resource to research and development with the focus for that investment on products and process that could develop into sustainable and profitable revenue streams. R&D spend for the year was £1.02 million (FY20: £1.05 million<sup>5</sup>), of which £0.26 million was capitalized (FY20: £0.25 million). During the year the Group claimed R&D tax credits of

<sup>5</sup> Based on calculations submitted to HMRC for the R&D tax credit.



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£0.36 million (FY20: £0.39 million) and it is expected that this claim will be received during the current year.

Total comprehensive loss for the year was £3.59 million (FY20: £4.23 million). The loss per share for the year was £0.01 (FY20: £0.01 loss).

## Statement of Financial Position and Cashflows

As at 30 June 2021, net assets amounted to £6.76 million (2020: £7.45 million), including cash balances of £1.64 million (2020: £0.82 million). Other current assets reduced to £3.00 million at the year-end (2020: £3.32 million) and this was mainly related to the reduction in inventory of £0.39 million at the US facility during the year. We anticipate inventory levels will continue to reduce over the next 12 months at the US site. Current liabilities reduced to £2.78 million as at 30 June 2021 (2020: £2.92 million) due principally to the reduction in Trade and other payables.

The Right of Use Asset in respect of its leased premises increased to £2.58 million (FY20: £1.59 million) due to a renewed lease on our US facility and the Right of Use Liability which is split between Current and Non-Current Liabilities similarly increased to £2.74 million (FY20: £1.65 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 £1.03 million (FY20: £1.44 million) reduced in the year due to a combination of exchange rate gains and positive movements in the plans funding requirements.

Net cash outflow from operating activities before working capital movements for the year reduced to £2.04 million (2020: £2.58 million), the principal contributing factors being the Loss before Taxation of £3.41 million (2020: £4.02 million). Cash used in Operations reduced by £1.74 million in the year to £(1.58) million (FY20: £(3.32)) million. The Group received a R&D tax credit inflow of £0.39 million in FY21 (FY20: £0.85 million). The prior year figure included payments for the R&D claims made in both FY18 and FY19. Net cash used in operating activities reduced to £(1.19) million (FY20 £(2.48) million).

Capital expenditure in the year, excluding the IFRS 16 adjustments set out below, was £0.22 million (FY20: £0.04 million).

## Capital Structure and Funding

As at 30 June 2021, the Company had 425,279,798 ordinary shares in issue (2020: 340,223,848). No options were exercised into ordinary shares during the year (FY20: none).

The Group repaid borrowings of £0.22 million during the year under review (FY20: £0.84 million), which almost wholly related to the Group's US borrowing facilities which are secured on the Group's US based tangible assets.

The Company received £0.80 million of a £1.1 million UKRI Innovation Loan during the year to support scale up capital expenditure. The remaining funds are expected to be drawn down in FY22. The Group's US working capital facility which was secured on a combination of the fixed assets, inventory and trade receivables of the US business was fully utilised at the year-end (2020: fully utilised). The net result was that the Group's total borrowings at the year-end were £1.73 million (2020: £1.25 million), of which £0.85 million was in the UK and the balance in the Group's US subsidiaries. The UKRI Innovation loan a quarterly liquidity covenant applies until April 2024. There are no financial covenants extant in respect of the UK bounceback loan of £0.05 million (FY20: £0.05 million) or the Group's US borrowings.

## Post Balance Sheet Event

On 20 September 2021, the Company raised £5.10 million (gross) through the placing, retail offer and subscription of 85,055,893 new Ordinary Shares at 6.00 pence per share. The funds raised will be used to fund the general working capital needs of the business, support the scaling up of manufacturing capacity at the Ammanford site and drive forward product rollout into the US market.

## Key Performance indicators

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

	FY21 (£m)	FY20 (£m)
Revenue	2.90	2.95
Gross profit margin	68%	70%
Adjusted operating loss	(2.17)	(2.54)
Cash position	1.64	0.82
Borrowings	1.73	1.25

During the year under review, management also used a sales tracker, a key 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.

## SECTION 172(1) STATEMENT

The Directors acknowledge their duty under s.172 of the Companies Act 2006 ("s172") 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 16.



## PRINCIPAL RISKS AND UNCERTAINTIES

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

### *Impact of Covid-19 and General Economic Uncertainty*

Despite a robust performance, the Covid-19 pandemic has adversely affected customer demand and subdued Group revenues during the year under review. The Directors accept that there remains a varying degree of economic uncertainty in all of the countries in which it has facilities and in the markets in which it operates. The Directors are provided with detailed projections that model future performance and liquidity of the Group and funding decisions are based on these forecasts.

### *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.

### *Acceptance of the Group's Products*

The success of the Group will depend on the market's acceptance of, and attribution of value to, advanced materials technology developed by the Group based on successfully mixing and dispersing raw, mined graphite, synthetically produced graphene and other nanomaterials into customers' existing products in order to improve the mechanical, thermal or electrical properties of these products.

Notwithstanding the technical merits of the processes developed by the Group, and the extensive market and product research carried out by management to assess the likelihood of acceptance of the Group's products, there can be no guarantee that its targeted customer base for the processes will ultimately purchase the Group's products.

### *Speed of product adoption*

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. Following the realignment in 2019, 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 maintain adequate protection of its IP portfolio, covering its manufacturing process, additional processes, products and applications, including in relation to the development of specific functionalisation of graphene and other nanomaterials for use in particular 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 assist.

### *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 ensure our ability to attract and retain key employees.

By order of the Board

**David Banks**

Chair

14 December 2021