Haydale – "Creating Material Matters" Interim Results to 31 December 2016

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# **Presentation Team** Ray Gibbs – CEO

## Matt Wood – CFO

## **Overview of Haydale**



- Haydale is a global nanomaterials group with centres of excellence established in the EU, USA and Far East
- Transitioning from a R&D "technical" centric business to an organisation focused on the sales and marketing of graphene and other nano materials as "masterbatch" products
- Focused on the use of nano materials that use and add compatible chemical groups to ensure homogeneous dispersion
- Considerable mixing and dispersion know how following 18 months work on epoxy resins (Huntsman)

An enabling knowledge and patented process based technology focused on delivering intermediate "masterbatch" products that add value in:

- Resin and polymer based composites
- Advance materials including Silicon Carbide, additive manufacturing (3D printing) conductive Inks/paints, rubber and technical coatings

## OPERATIONAL HIGHLIGHTS



#### Setting up geographic coverage:

- Acquisition of Innophene in Thailand (HTT)
- Purchase of Advance Composite Materials in USA (HTI)

#### **Collaborations and Products:**

- Huntsman and thermal conductivity
- Delivery and commissioning of reactors to supply chain partner AMG (Germany)
- 3D PLA printing launch

#### **Future Developments:**

- Everpower strategic investment of £3.26m
- Contract win at HTI of US\$2.6m
- Initial polymer pipe testing and development project
- Carbon fibre improvements in mechanical, thermal and electrical
- Sensors Far East FDA approved inks through Dowton
- Start of contract wins in HTT

### FINANCIAL HIGHLIGHTS



#### **Consolidated Profit and Loss** (unaudited)

6 months ended 31 December	H1 2016	H1 2015	Y/E June 2016
	<u>£'000</u>	<u>£'000</u>	<u>£'000</u>
Revenue	1,106	325	1,169
Other income	384	<u>    459</u>	754
Group income	1,490	784	1,923
Expenses			
R & D expenditure	(548)	(496)	(514)
Share based payment expense	(187)	(174)	(326)
Other administrative expenses	<u>(3,350)</u>	(2,121)	<u>(5,092)</u>
Group costs	<u>(4,085)</u>	<u>(2,791)</u>	<u>(5,932)</u>
Loss from operations	(2,403)	(1,917)	(3,637)
Loss per share (£)	(0.15)	(0.16)	(0.26)
Adj EBITDA	(1,902)	(1,546)	(2,970)
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### FINANCIAL HIGHLIGHTS



#### **Consolidated Balance Sheet**

	(unaudited) Dec 2016	(unaudited) Dec 2015	30 June 2016
	<u>£'000</u>	<u>£'000</u>	<u>£'000</u>
Non-current assets	7,329	3,342	3,402
Inventories	1,048	503	398
Receivables and other	1,897	615	1,041
Cash		<u>5,020</u>	2,862
Total Assets	11,401	9,480	7,703
Deferred consideration	500	117	-
Bank loans	1,626	352	270
Trade payables and other	1,435	807	832
Total Liabilities	3,561	1,276	1,102
Total Net Assets	7,840	8,204	6,601

### FINANCIAL HIGHLIGHTS

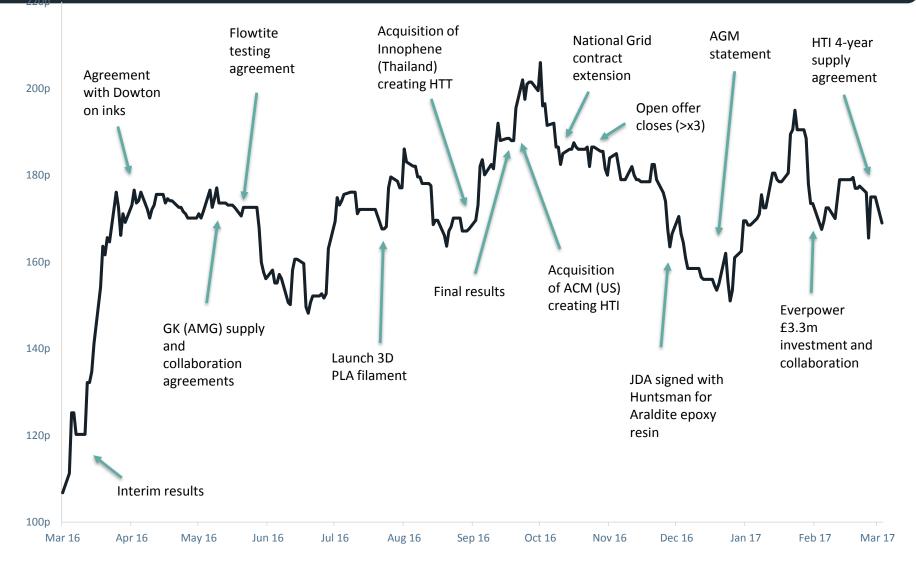


#### **Consolidated Cash flow (unaudited)**

	H1 2016	H1 2015	Y/e June 2016
	<u>£'000</u>	<u>£'000</u>	<u>£'000</u>
Loss before taxation	(2,624)	(2,014)	(4,023)
Non cash items	501	371	667
Operating cash flow	(2,123)	(1,643)	(3,356)
Working capital movement	(244)	(482)	72
Cap Ex / investing activities	(250)	(484)	(1,056)
Net cash from equity issues	2,434	5,661	5,359
Net borrowing movements / FX	<u>(1,552)</u>	<u>(81)</u>	<u>(206)</u>
Net (decrease)/increase in cash	(1,735)	2,971	813
Cash at the beginning of the period/year	2,862	2,049	2,049
Cash at the end of the period/year	1,127	5,020	2,862

## SHARE PRICE PERFORMANCE





## Resins & Polymer based Composites Strategic Business Unit



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### Traditional Polymer Composites



#### Long or Continuous Fibre Reinforcement (50%)

- Strength and Stiffness
- Impact resistance

### Performance Improvements

- ✓ Mechanical
- ✓ Electrical
- ✓ Thermal
- ✓ Physical

### Polymer Matrix (50%)

Thermoset resins 75% Thermoplastic 25%

- Environmental Resistance
- Transfer of external loads into Fibres

Thermoplastic Composite development on a Gas Transition Piece with National Grid - £310k

### **Composite opportunities – Pre Preg**

#### Electrical conductivity:

- Better lightning strike resistance
- De-icing systems
- Anti-static coatings
- Resistance measurement as a diagnostic
- Airbus aileron result

### Thermal conductivity:

- Management of heat and cooling
- Composite tooling market
- Huntsman focus

#### Mechanical properties:

- Improved stiffness and strength
- Toughness
- Bruisable composites





Picture : Mark Lloyd





### Work with Huntsman



• Preliminary work now complete

Beta test for selected customers (6-12 months)

- Focus on graphene adhesive and carbon fibre pre preg for thermal conductivity
- Toughened adhesive first awaiting a timeline for launch
- Thermally conductive pre preg (2018)
- Target markets remain high end applications for automotive and Aerospace
  - Composite wheels
  - Tooling
  - Pultrusion

## Flowtite



#### Damage tolerance:

- Better impact performance
- Improved fatigue resistance
- Better wear resistance
- Health monitoring as an add on (Analytics)

#### Flowtite project:

- Improve impact performance
- Marketing edge
- Premium pricing
- €750 million sales. Best in class and market leader
- Uses 150,000 tonnes of resin. Processing crucial
- Trial April 2017
- Merger with EU based HOBAS drinking water pipes
- New opportunity for thermoplastic pipes



### Pre preg opportunity



#### **In-House pre preg development:**

- Independent verification of up to 20% improvement in mechanical properties
- Design of lighter structures with same performance
- Reduced costs of materials
- Researching industrial pre preg operations for marketing and sales
- Masterbatch approach using AMG as industrial supply partner
- Data sets being prepared for test marketing

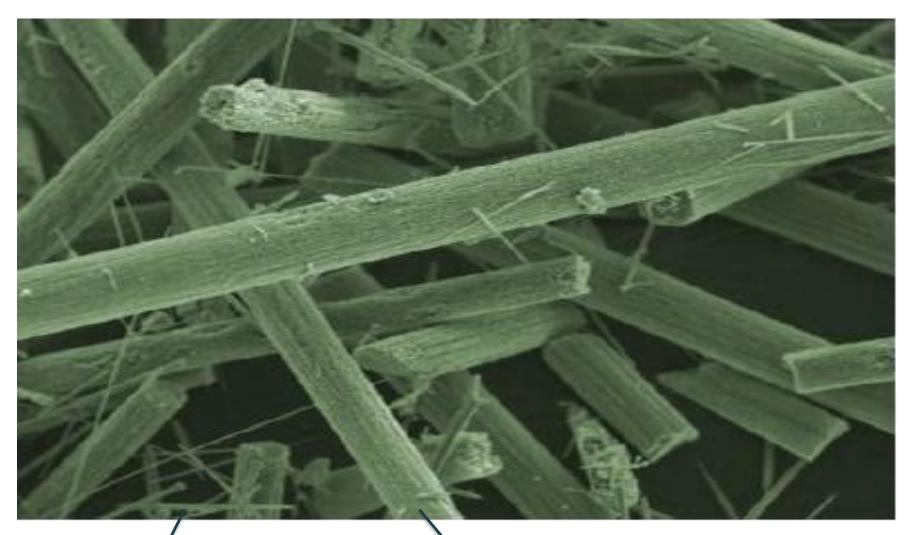
# Advanced Materials Strategic Business Unit



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### Silicon Carbide (SiC) fibres and whiskers







### USA and RoW opportunity



- Established market position in SiC fibre and whisker
  - Recognised producer of high quality product
  - >15 regular customers
- EBITDA positive but minimal marketing & sales effort to date
  - Trevor Rudderham as CEO of USA
  - New Sales and Marketing Director
- Commercial upside
  - Low cost feed stock (rice husks) and high gross margins (55%-70%)
  - Growing order book and requirement for new inventory (Fibres)
  - New win worth US\$2.6m over 4 years starting in April 2017
- Scalable facilities
  - Strategic location, permits, powder handling credentials, H&S record
  - Low cost incorporation of plasma reactor for graphene processing
- Cross selling
  - Graphene into ACM customers and SiC into Haydale customerscommenced on cookware opportunities.
  - Hybrids

### SiC markets

### **Existing markets**

#### Hard ceramic for cutting tools

- Land based turbines
- Jet engines

#### Wear resistant technical ceramics

- For harsh environments where metals fail
- High temperature, abrasive and chemical environments

#### **Protective coatings**

- Increased scratch resistance, cookware
- Coatings, oil and gas pipes
- Increased abrasion and impact resistance

### Potential markets

- Cookware and food
- 3D printing

17











### Haydale Technologies Thailand (HTT)



Its R&D capabilities are complementary to Haydale's needs to rapidly service customers in the Asia Pacific region

- Recent contract wins IPRC and Thai Energy Ministry
- Malaysian rubber contract
- Thailand Science Park facility official opening 29 March 2017
- Developed a range of inks including inkjet and other printing platforms
- Rapid development of graphene enhanced electrically conductive PLA

#### The Vision for HTT

- Haydale's low-cost Far East R&D, providing solutions and servicing customers in the APAC region
- A technical and product support service for Korean sales team, and use Taiwan collaboration with as volume production
- Migrate products to USA and EU

## Additive Manufacturing

#### Inks and Pastes:

- FDA approved inks for bio-med sensors
- Focussed on three key customers in APAC with known biomed sensor requirements
- Ink under evaluation for a mobile phone application

### 3D Printing (US\$20bn market):

- Graphene PLA launch repeat orders. Improved speed of processing – Dedicated sales manager
- New 3D printing materials under evaluation
- SiC fibres for thermal management in metal 3D composite parts







### The Everpower Factor



#### **Building a Graphene Capability in China:**

- In house production now being established
- Local Government funding for "in country" capability
- Sourcing products and processes

#### The Haydale Factor:

- Supplied sample products
- Sourcing nano materials in country
- Introducing Haydale as a technology partner to potential customers
- Met with and presented Haydale as a technology partner to BYD Auto along with others in the Everpower stable
- Contracts to be drafted post receipt of final tranche of subscription

## Outlook

- Moving to sales led SBUs to provide product and profit focus
- US has sales traction with ceramic and hybrid opportunities under consideration
- Far East gaining sight on FDA approved Bio-medical sensors and contract wins in Thailand to underpin overheads
- The Everpower factor
- Composites the bigger prizes will take longer for new products
- High value applications engineer solutions offers near term potential especially for thermoplastic pipes with enhancements
- Delivering consistent quality in volume through established supply chain
- Into targeted markets offering high growth and margins

# Appendices

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### Sensors

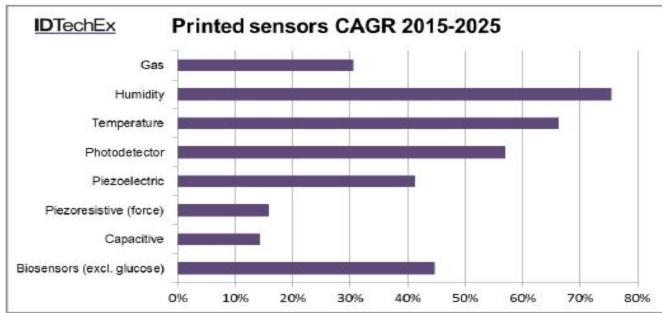


Emerging printed sensors have strong growth potential

20Bn Glucose strips- new regulations - BUT more

conductive ink required

Printed gas and other novel sensors









## **Everpower**



- Everpower International Holdings Co Ltd
- New York based investment company
- Invests in leading edge technologies and integration of these technologies into China -Haydale's route to China of the worlds biggest markets
- Subscription agreement to acquire 9.9% of Haydale at £1.70 (£3.3 million) balance of £2.9 million to be paid by 31 March 2017
- Once subscription finalised, Haydale to enter collaboration agreement with Everpower to manufacture, supply and market existing Haydale products and develop nanomaterials and new graphene products for the Chinese market
- Everpower have existing graphene interests, owning 70% of leading graphene producer, Angstrom Materials

# **Major Shareholders**



Investor	Holding as at 31 Dec '16	% Issued Share Capital
Hargreave Hale	1,566,539	9.20
Octopus Investments	1,369,619	8.04
Private Investors (UK)	1,281,224	7.52
Hargreaves Lansdown Asset Management	977,313	5.74
Private Investors (Europe)	715,552	4.20
Quilter Cheviot	689,748	4.05
Pilling & Co Investment Managers	601,629	3.53
Mr C W H John	571,557	3.36
Charles Stanley	502,252	2.95
Mr Raymond Gibbs	488,000	2.86
JM Finn & Co	427,579	2.51
Barclays Wealth	409,187	2.40

## Funds raised on AIM



- IPO in April 2014 £6.6 million at £2.10;
- Working Capital November 2015 £6.0 million at £1.60;
- ACM Acquisition October 2016 £2.6 million at £1.60; and
- Everpower Feb / March 2017 £3.3 million\* at £1.70.

<sup>\*</sup>Everpower subscription - due to complete by 31 March 2017

### Board



#### John Knowles, Non-executive Chairman

John has significant nanotechnology experience. He was until recently chairman of NanoSight Limited (sold to Spectris plc) and chairman of the Nanotechnology KTN Advisory Board. Over the past several years John has invested in and been Chairman/Director of several other high technology companies. He was also member of UK Government Nanotechnology Strategy Forum. John is a member of Haydale's audit committee.

#### **Ray Gibbs, Chief Executive Officer**

Ray was appointed CEO of Haydale in January 2013. Since then he has set the company strategy and defined the market focus into composites, inks/coatings and complimentary nanomaterials, culminating in a successful IPO on the AIM market in April 2014. Ray has been involved at Board level with high tech industry for over 20 years, with sales ranging from £500,000 to £500m.

#### Matt Wood, Chief Financial Officer

Matt has worked in the financial sector for almost 20 years and has served on the board of AIM Companies for more than 10 years. A fellow of the Institute of Chartered Accountants in England and Wales, Matt has overall responsibility for the Group's financial matters.

### **Board (continued)**

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#### **Graham Eves, Non-Executive Director**

Graham runs his own international business consultancy. He has advised a range of German, North American and Japanese automotive component/technology suppliers. Graham is also a Non-Executive Director of AB Dynamics. Graham is a member of Haydale's audit and remuneration committees.

#### **Roger Humm, Non-Executive Director**

Roger is a chartered accountant with over 30 years technology business experience. He runs his own consultancy business and has recently held finance roles with Ixico plc and G-Volution plc and is currently a director at Oxford Nanoimaging Limited, OMass Technologies Limited and Oxford Instruments Pension Trustee Limited. Roger is chairman of Haydale's audit committee.

#### **Roger Smith, Non-Executive Director**

Roger has over 30 years business experience in the oil, gas and energy sectors. During this time he has set up and subsequently sold two successful consulting businesses. He has held the post of Commercial Director for Bureau Veritas SA and most recently was a Senior Vice President at Petrofac Plc. Roger has a degree in Physics from the University of Southampton. Roger is chairman of Haydale's remuneration committee.

