

**ASX/Media Release**  
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## **JOINT VENTURE FOR SYN DYNAMICS - FIRST COMMERCIAL SCALE WASTE TREATMENT PLANT**

### **HIGHLIGHTS**

#### **Commercial**

- Clean-tech company Syn Dynamics Australia Pty Ltd (SDA) has entered into a 50:50 Joint Venture with leading waste and environmental services company Total Waste Management for SDA's first commercial scale waste treatment processing plant.
- SDA is a breakthrough next generation plasma gasification business able to convert a wide range of hazardous carbon-based waste materials into a high-value synthetic gas known as 'syngas'.
- The JV entity has been incorporated with initial plans to install and operate a commercial scale plant with capacity to treat over 10,000 tonnes per annum of hazardous waste over a 20 year design life. The plant is expected to be commissioned in H2, calendar year 2018.
- Following the successful operation of the initial plant, the JV then proposes to install and operate multiple, large scale commercial plants at targeted locations throughout the APAC region.
- Total Waste Management's operations have a significant presence in the petroleum, mining, industrial and commercial sectors in the APAC region.

#### **Expanded Global Best Practices R&D Facilities**

- SDA continues to make strong progress on its R&D program with the Commonwealth Scientific and Industrial Research Organization (CSIRO) – with design specifications and plans completed for a commercial scale pilot plant at CSIRO's Queensland Centre for Advanced Technology which is on track to commence operations this quarter.
- The pilot plant is a key component in SDA's development timeline and will provide an essential step between testing its successful Proof of Concept and the proposed first commercial plant.

#### **Global Specialist Engineering Firm Engaged**

- SDA has engaged global design and first-in-process engineering specialist Advisian Pty Limited (Advisian) for its reactor design and process specifications with a project management and supervisory role for SDA's plant procurement and fabrication requirements. Advisian is a wholly owned subsidiary of market leading global consulting engineer firm Worley Parsons Limited (ASX:WOR).
- The pilot plant design and specifications have been completed with procurement and fabrication to follow. The plant has significant technical process, componentry and material improvements to optimise performance features required for large scale high volume operations including continuous injection feed multi-shift processing.

- Chapmans' subsidiary Chapmans Opportunities has a strategic 80% interest in SDA, and views the successful commercialisation of SDA's waste-to-energy technology as being highly value accretive.

#### **TWM HAZTEK Holdings Pty Ltd**

The Directors of Chapmans Limited (ASX: CHP) (Chapmans, the Company) are pleased to announce that clean-tech business Syn Dynamics Australia Pty Ltd (SDA) has successfully completed due diligence and has formally entered into a Joint Venture Agreement (Joint Venture) with leading APAC region waste and environmental services company, Total Waste Management, for SDA's first commercial scale hazardous waste-to-energy plant.

The Joint Venture is a significant milestone for SDA and its next-generation plasma gasification technology which converts a wide range of waste material into a high value synthetic gas (syngas). It formally brings together SDA's market leading technology with a major waste management operator with the scope to maximise the commercial potential of SDA's technology.

The Joint Venture company, registered as TWM HAZTEK Holdings Pty Ltd is an equal 50:50 owned entity with equal board representation from both parties, proposed to comprise two board members from each party.

#### **Under the Joint Venture the parties propose to;**

- Install and operate a commercial scale plant with a capacity to treat +10,000 tonnes per annum of hazardous waste over a 20 year design life – the plant is expected to be commissioned in H2, calendar year 2018;
- bulk test various waste feedstock samples from a range of existing TWM Asia Pacific customers in order to refine and maximise processing efficiencies for the first commercial scale plant;
- initially focus on hazardous waste from the oil & gas and petrochemical industries;
- utilise the findings of the operation of this initial commercial scale plant to develop further larger scale commercial product offerings, suitable for a range of hazardous waste materials; and
- then install and operate multiple, large scale commercial plants at targeted locations throughout APAC.

The Joint Venture will also obtain relevant permits and environmental approvals required for the construction and processing of waste feedstocks at the commercial scale plant, and additional commercial plants constructed under the Joint Venture.

Chapmans subsidiary company, Chapmans Opportunities Limited (COL), has a majority, strategic 80% interest in SDA. SDA's breakthrough next generation plasma gasification technology (Plasma Hydrous Pyrolysis, PHP) converts a wide range of waste materials into high value syngas. PHP is able to remediate 100% of hazardous waste feedstocks (excluding any residual metals) into non-hazardous products including syngas compared to other competing technologies which typically achieve significantly lower conversion rates, produce tars and toxic chemicals which along with exceptionally high energy consumption requirements, limits their mass scale adoption.

TWM is a world class APAC-focused waste and environmental services company headquartered in Papua New Guinea. Its operations cover key industries including; petroleum, mining, industrial and the commercial sector and its service offering includes cleaning and industrial services, facilities management and civil and environmental engineering.

**TWM Director Kori Chan said:**

*"We are delighted to form our Joint Venture with Syn Dynamics and bring together best-of-breed technical, commercial and operational experience. Through our Joint Venture we believe we are well positioned to capitalise on the growing requirements of our customers for a new and compelling sustainable solution for their hazardous waste."*

**SDA Director Anthony Dunlop said:**

*"The incorporation of TWM HAZTEK and preparation for our first commercial scale plant is an important milestone for Syn Dynamics and Chapmans. We are excited to join forces with TWM. We have clear alignment of objectives and a strong cultural fit including a commitment to delivering unique value and service to our customers."*

**CSIRO R&D Program – Tangible Results Driving Real Value**

SDA recently completed a highly successful 12 month R&D and Commercialisation Project with the Commonwealth Scientific and Industrial Research Organization (CSIRO). Under this Project, SDA engaged CSIRO to conduct a first phase scientific validation program at its Queensland Centre for Advanced Technology (QCAT) facility located in Pullenvale Queensland, which amongst other domains, specialises in gasification processing technologies. During this critical first phase of commissioning, testing and analysis, CSIRO achieved major milestones including:

- Installing and integrating SDA's plasma reactor into CSIRO's QCAT gasification research facility;
- Establishing SDA's reactor as a measurable and stable scientific instrument;
- Validating SDA's (PHP) plasma reactor processing as a hazardous waste conversion technology;
- Enhancing SDA's plasma reactor's capabilities to underpin fundamental development research; and
- Establishing an advanced analytical capability able to quantify reaction results and syngas properties with scientific precision.

CSIRO continued with a second phase focused on expanding knowledge surrounding waste feeds, plasma control, and energy and mass balances in order to provide sufficient data for design engineering of a commercial plant. CSIRO were successful in advancing PHP knowledge and again achieved major advances including:

- making significant progress in electrode configuration and design;
- making important scientific discoveries around PHP processes; and
- increasing plasma volume whilst reducing power requirements by nearly an order of magnitude.

SDA and CSIRO have agreed to extend the R&D and continuous improvement testing program at QCAT, and continue to make strong progress. Current work being undertaken includes;

- Design, construction and commissioning of a commercial scale Pilot Plant (see below) which is able to function as test rig operatable across a broader range of temperatures and pressures;
- Extending QCAT's analytic infrastructure in order to widen the hazardous waste types tested; and
- Testing advanced hazardous waste injection systems.

### Next Phase of R&D Project - Commercial Scale Pilot Plant

SDA has engaged specialist design and process engineering consulting firm Advisian Pty Ltd, a wholly owned subsidiary of global consulting engineering group Worley Parsons Limited (ASX: WOR), to manage the design, specification, procurement, fabrication and construction of a commercial scale pilot plant at CSIRO's QCAT facility.

With approximately 3,000 employees servicing the Americas, China and the Asia Pacific region, Europe, the Middle East and Africa, including specialist expertise across Hydrocarbons, Minerals & Metals, Infrastructure and Chemicals, Advisian brings global resources and experience to SDA's commercialisation requirements including:-

- Business Case design, testing and analysis;
- Project Feasibility Analysis including detailed modelling and financial analysis;
- Technical assessment, procurement and risk analysis;
- Environmental Analysis and Planning;
- Support with Quality Assurance, Regulatory Assessment and Compliance

The commercial scale Pilot Plant represents the next phase of the R&D program and commercialisation plan for SDA's waste-to-energy technology, ahead of its proposed full scale commercial roll-out. Work on the Pilot Plant is progressing well and remains on schedule to be completed this year.

The Pilot Plant will have a throughput capacity of 40kg of waste material per hour and represents a key milestone in the technology's successful development process, providing an essential step between its successful laboratory scale batch processing and the first industrial scale commercial plant.

### About Plasma Gasification and Syn Dynamics' Technology

Gasification is a process by which carbon based material is converted into a gaseous fuel, namely a mixture of carbon monoxide and hydrogen – also known as synthetic gas or syngas.

Plasma gasification is a next-generation extension of the gasification process and has undergone a surge in interest and commercial application over recent years. It uses an ionized gas (a plasma) to convert the organic matter into syngas or solid waste.

SDA's Plasma Hydrous Pyrolysis (**PHP**) technology is designed to address the performance, efficiency and scale characteristics of existing gasification technology with the objective of optimising conversion, cost and accessibility requirements of global waste mass markets.

PHP has the advantages, relative to other gasification systems, of having no formation of tars which are detrimental to gasification systems and no toxic chemicals (such as dioxins) produced in the gas stream.

Syngas is a global commodity in its own right and represents a key building block of modern chemical industry, with a wide range of commercial uses and applications. These include electricity generation and as a liquid fuel source.

Syn Dynamics' plasma gasification technology has three compelling technical advantages;

- Its extremely high waste-to-syngas conversion rate which contributes to its cost effectiveness;
- Its ability to treat a wide range of waste material including hazardous waste, biomass and landfill, in addition to solid hydrocarbons such as coal; and
- Unique reactor architecture resulting in much lower CAPEX and OPEX profiles.

These factors open up substantial global commercial market opportunities in the corporate and government sectors, as large organisations seek new waste utilisation and storage solutions.

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**About Chapmans**

Chapmans (ASX: CHP) is an ASX listed diversified investment company engaged in special situation investments across a diverse range of industries, with a focus and expertise in the mobile and advanced industrial technology sectors. It seeks to be an active strategic investor in high growth areas of the market, and to identify and work with emerging high growth companies. The Company's investment philosophy and approach are based on a unique mix of high conviction and special situation features, characterised by advisory and equity investments structured around specific events and assets for both public and large private corporates.

**About COL**

Chapmans Opportunities Limited (COL) is a subsidiary of ASX-listed diversified investment company Chapmans Limited (ASX: CHP). It is an investment entity focused on making investments in small to medium Australian companies, predominantly providing active expansion capital in the technology and innovation sectors. COL plans to seek an ASX-listing in due course.