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# Pelletising tests confirm Hawsons Supergrade a standout material for iron making

## Highlights

- Tests show Hawsons exceptional Supergrade iron ore pellet feed produces top tier iron ore pellets that will be keenly sought by buyers
- Excellent chemical, physical and iron making properties of pellets confirm Supergrade is a standout raw material
- Results meet or exceed specifications for DRI producers
- Hawsons Supergrade product would improve pelletising and iron making productivity and reduce energy consumption when added to most pellet blends, boosting its market appeal
- Carpentaria is manufacturing over 50kg of DR quality pellets for customer testing and DRI performance test work

Emerging iron producer Carpentaria Exploration (ASX:CAP) announced today results of recent test work from the Company's flagship Hawsons Iron Project demonstrating that its Supergrade product is amongst the world's best iron ore pellet feeds and can produce top tier iron ore pellets, that will be keenly sought by buyers.

The tests, from the China Iron and Steel Research Institute (CISRI), showed pellets made from 100% Hawsons Supergrade gave outstanding results based on buyers' criteria, namely high iron and low slag content, superior physical properties and excellent iron making characteristics.

The superb results meet the exacting specifications provided to Carpentaria by direct reduction iron (DRI) producers. Results also showed the Supergrade product, when added to typical Chinese pellet blends, provided substantial improvement in the chemistry, strength and iron making performance of typical Chinese pellets.

Commenting on the results, Carpentaria's Managing Director, Quentin Hill said: "These results are a real boost for our product marketing programme and a significant step forward for Hawsons. They provide more confidence in the product quality and performance as we build buyer support across the DR market, the Chinese pellet feed market and the Asian high grade blast furnace market.

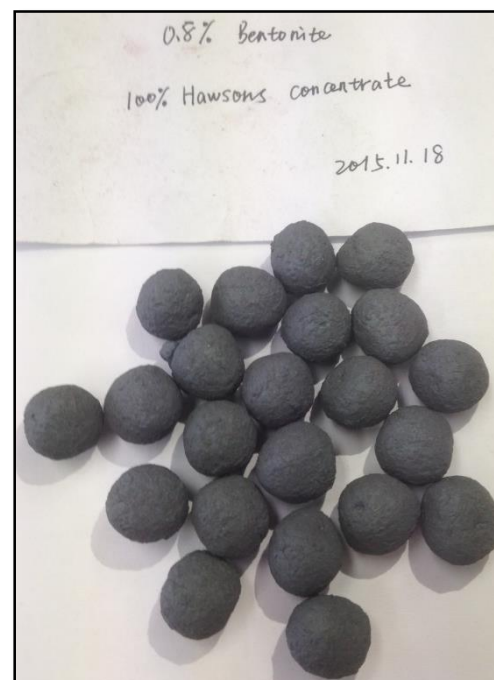
"High quality raw materials such as Hawsons Supergrade are increasingly important to end users seeking to increase productivity and curb pollution during steel making. This trend is likely to be more pronounced in coming years and high quality raw materials can attract significantly higher prices than standard iron ore, for example, DR pellet prices are typically over USD \$40/t more than the standard 62%Fe index price," he added.

Located 60km south-west of Broken Hill, the Hawsons project has access to existing rail, road, port and power infrastructure, with its uniquely soft ore allowing for simple liberation of a premium magnetite product without expensive processing methods.

The project's low costs and world class product is attracting buyer support and the Company plans to convert this interest into project investment and position Hawsons as the preferred and ready project to meet the next iron ore development cycle.

Carpentaria has requested CISRI to produce over 50kg of pellets next month from the Supergrade concentrate produced last quarter, which will then be available for direct reduction iron making tests.

"The Hawsons project has a bright future as a long term, low cost source of premium iron products. With a Supergrade product, a super location and super competitive costs, we are confident that we can attract the investment required to develop the project further and deliver increased value for shareholders," Mr Hill said.



Composition (%)	Supergrade Pellet Feed (ALS, CISRI)	Supergrade pellets (CISRI) Fired at 1230°C	Midrex DR Specifications*
Fe	70.3	67.80	67.00 min.
SiO <sub>2</sub>	1.99	2.39	
Al <sub>2</sub> O <sub>3</sub>	0.29	0.44	
SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub>	2.28	2.83	3.00 max.
P	0.007	0.008	0.030 max.
S	0.001	0.003	0.008 max.
TiO <sub>2</sub>	0.11	0.10	0.15 max.
CCS (Kg/pellet )		324	>250

Table 1 Hawsons specifications based on recent bulk test work at ALS Iron Ore Technical Centre (ASX Announcement, 14 October 2015) , Perth and CISRI (February 2016). \*P8 The Midrex Process by Midrex 2015.

Full results can be seen in the Appendix.

### **About Hawsons Iron Project**

The Hawsons Iron Project joint venture (Carpentaria 62%, Pure Metals P/L 38%) is currently undertaking a bankable feasibility study based on the low cost, long term supply of a high grade, ultra-low impurity iron concentrate to a growing premium iron market.

The project has a clear technical and permitting pathway. It is located 60km southwest of Broken Hill, an ideal position for mining operations with existing power, rail and port infrastructure available for a conceptual 10 Mtpa start-up operation. A mining lease application has been lodged.

The project's soft rock is different from traditional hard rock magnetite and allows a very different approach to the typical magnetite mining and processing challenges (both technical and cost-related). The soft rock enables simple liberation of a Supergrade magnetite product without complex and expensive processing methods.

The Company is targeting the growing premium high grade product market, which is separate to the bulk fines market, and believes its targeted cost structure is very competitive and profitable at consensus long-term price forecasts for this sector.

The project is underpinned by Inferred and Indicated Resources totalling 1.8 billion tonnes at 15% mass recovery for 263 million tonnes of concentrate grading at 69.7% Fe. The Company confirms that it is not aware of any new data that materially affects this resource statement since the first public announcement and that all material assumptions and technical parameters underpinning the resource estimates continue to apply and have not materially changed since first reported (ASX Announcement 26 March 2014 and Table 2).

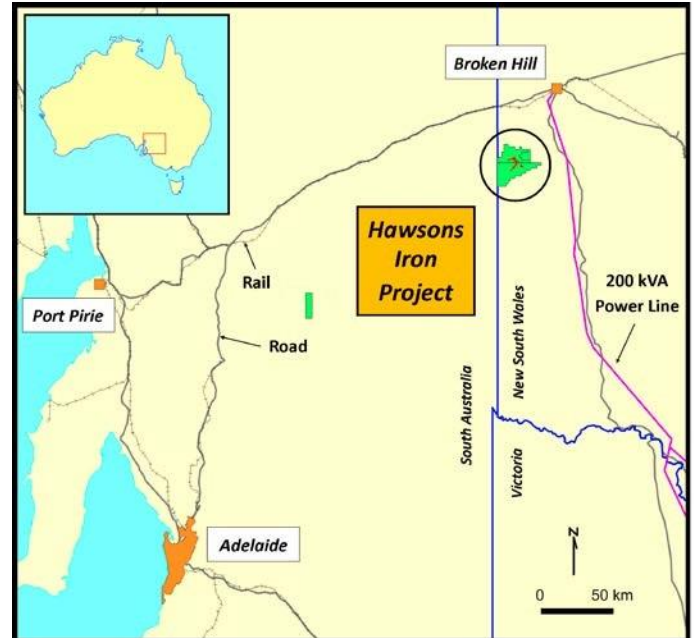


Figure 2 Location of Hawsons Iron Project and Port Pirie

Category	Billion Tonnes (cut off 12% mass recovery)	Magnetite mass recovery (%)	concentrate grades					Contained Concentrate million tonnes
			Fe%	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	P%	LOI%	
Inferred	1.55	14.7	69.6	2.9	0.20	0.004	-3.0	228
Indicated	0.22	16.2	69.8	2.8	0.20	0.005	-3.0	35
<b>Total</b>	<b>1.77</b>	<b>14.9</b>	<b>69.7</b>	<b>2.9</b>	<b>0.20</b>	<b>0.004</b>	<b>-3.0</b>	<b>263</b>

Table 2 JORC compliant resources- Hawsons Iron Project

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The information in this report that relates to Exploration Results, Exploration Targets and Resources is based on information evaluated by Mr Q.S. Hill who is a member of the Australian Institute of Geoscientists (MAIG) and who has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"). Mr Hill is a Director of Carpentaria Exploration Ltd and he consents to the inclusion in the report of the Exploration Results in the form and context in which they appear.

## APPENDIX - SUMMARY OF CISRI PELLETISING RESULTS

Over 250kg of Hawsons pellet feed was sent to CISRI late 2015 for pelletising tests and iron making performance tests on the pellets. The following summarises the results.

Hawsons Technical Director Ray Koenig, former superintendent of pelletising at Savage River, Tasmania, said the Supergrade product had performed superbly during the latest tests.

“The Supergrade product’s naturally fine grain size distribution is perfect for pelletising and magnetite is a better pellet feed than typical hematite fines because it releases heat into the system during pellet firing. This means lower pellet production costs, more even firing, less binding agent and 30% of the energy requirement of typical hematite,” he said.

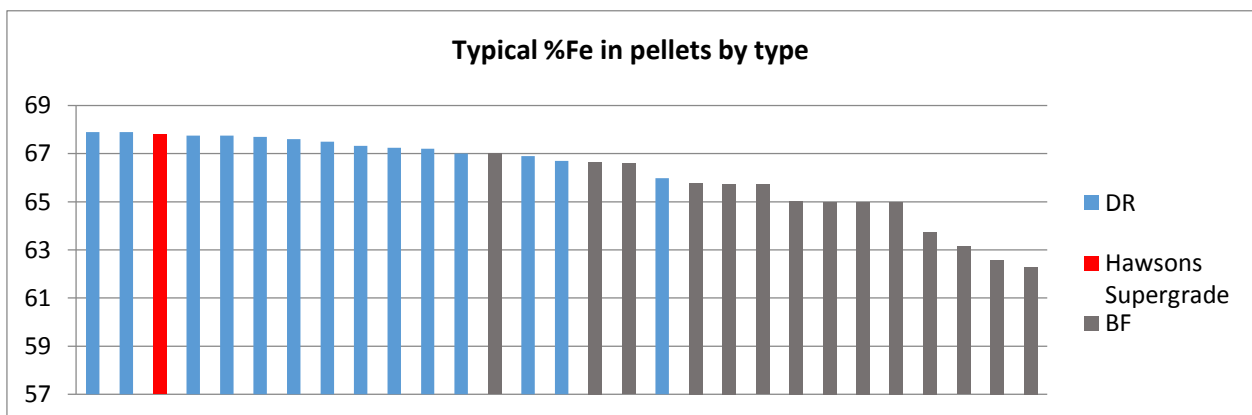
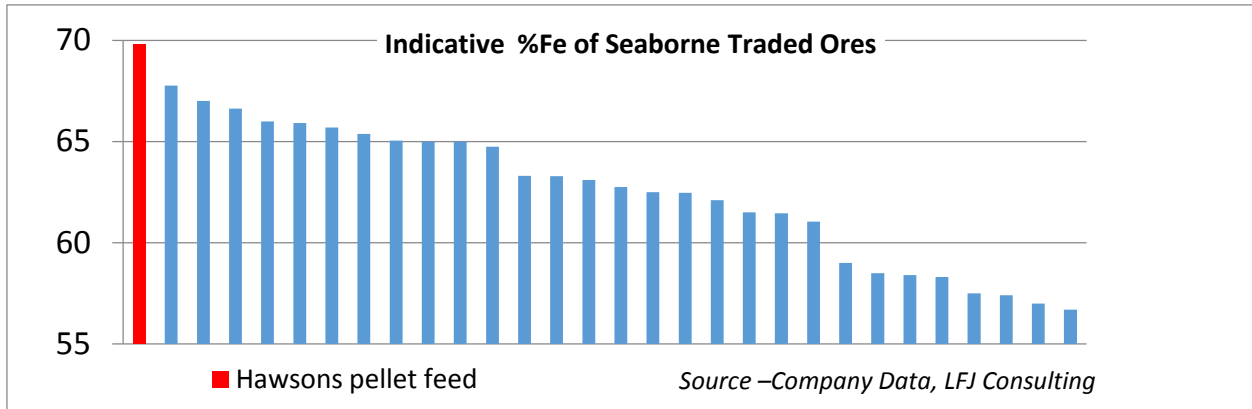
Lou Jelenich, Carpentaria’s technical marketing consultant and former Technical Superintendent of Ironmaking at Newcastle Steel Works and Technical Marketing Manager for BHPB Iron Ore said both the pellet feed and the pellets had met or exceeded the specifications provided by Asian and Middle Eastern steel mills during recent marketing trips, including direct reduction customers.

### Test Work Results

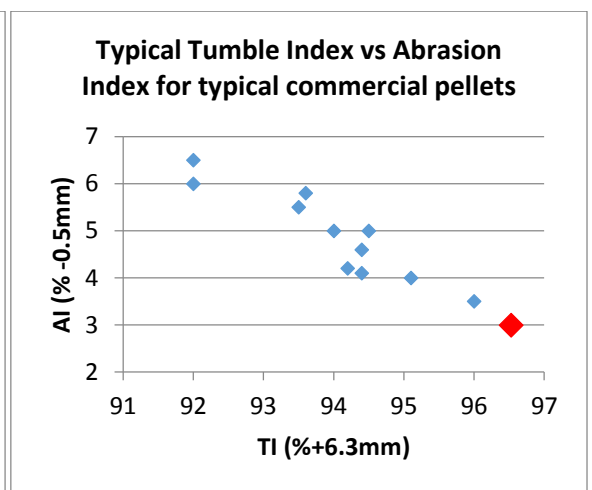
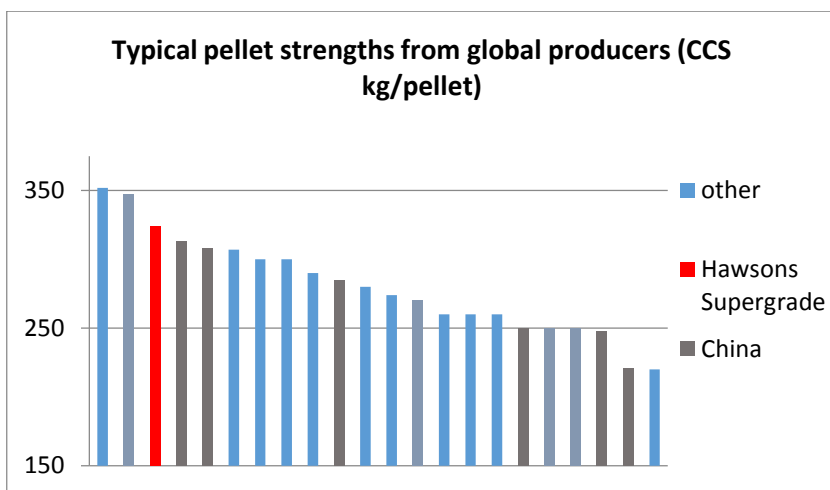
Elements and Compounds		Supergrade Pellet Feed (ALS, CISRI)	Supergrade pellets (CISRI) Fired at 1230°C	Midrex DR Specifications*
chemical Analysis (%) (on dry basis)	Fe	70.3	67.80	67.00 min.
	SiO <sub>2</sub>	1.99	2.39	
	Al <sub>2</sub> O <sub>3</sub>	0.29	0.44	
	SiO <sub>2</sub> + Al <sub>2</sub> O <sub>3</sub>	2.28	2.83	3.00 max.
	CaO	0.11	0.15	
	MgO	0.2	0.22	
	P	0.007	0.008	0.030 max.
	S	0.001	0.003	0.008 max.
	TiO <sub>2</sub>	0.11	0.10	0.15 max.
	Na <sub>2</sub> O	0.032	0.056	
	K <sub>2</sub> O	0.05	0.054	
Physical Properties	Blaine Index (cm <sup>2</sup> /g)	1910		
	Tumble (% +6.3mm)		96.53	NA
	Abrasion (% -0.5mm )		2.99	NA
	CCS (Kg/pellet )		324	>250
Metallurgical Properties	Reducibility Index (%)		62.04	
	Reduction swelling index (%)		13.92	
	Softening/Melting (Kpa.°C)		551	

Hawsons indicative specifications based on bulk pellet feed test work (ASX Announcement, 14 October 2015) and China Iron and Steel Research Institute test work (CISRI) in Beijing February 2016). \*P8 The Midrex Process by Midrex 2015.

**Chemical characteristics** - Hawsons pellet feed and pellets have exceptional iron grade.

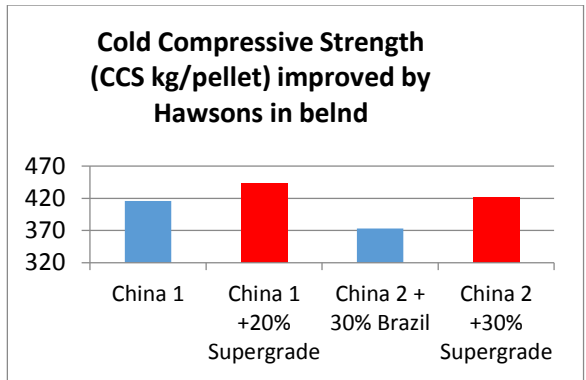
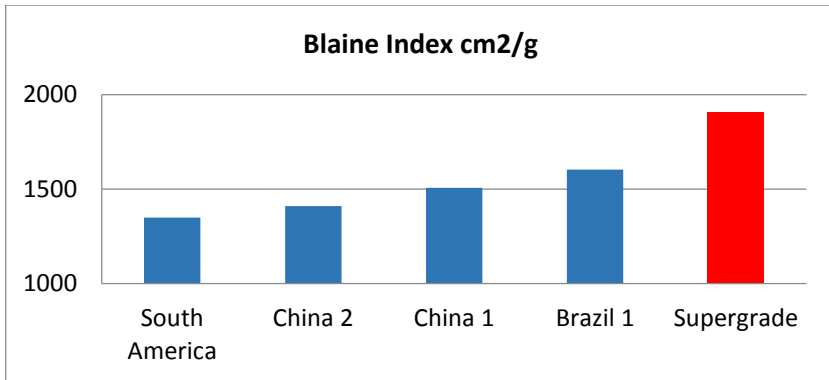


**Physical Characteristics and pelletising properties**



Pellet strength is important during transportation and handling to preserve optimum size for iron making productivity and high feed yields. Feedback from end users indicates over 280 is preferred, and over 300 is very good. Carpentaria has chosen pellet firing conditions to achieve over 300. Data source, Company data, lab data, Poveromo 2015

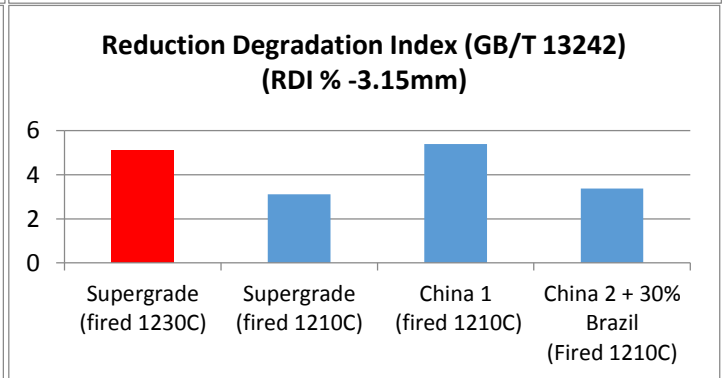
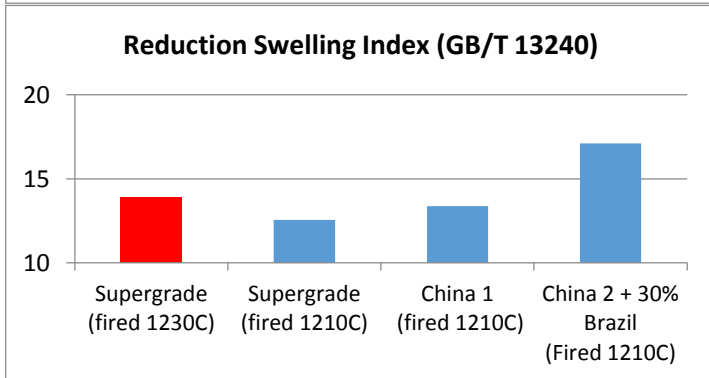
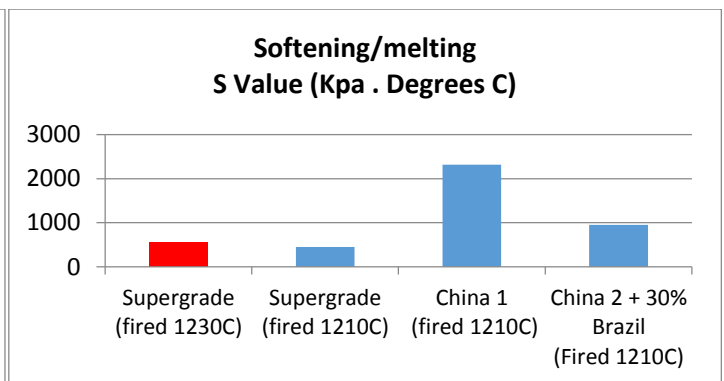
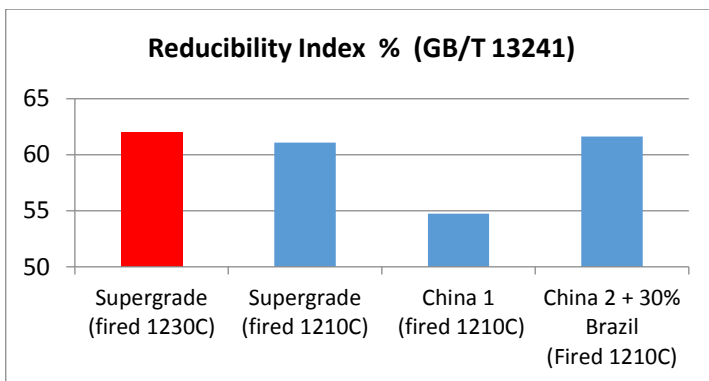
High tumble index (TI) and a low abrasion index (AI) is preferred because this minimises losses and preserves optimum size for iron making during transportation, handling. Supergrade pellets (red) are shown as outstanding. Data source, Company data, lab data, Poveromo 2015.



Blaine Index is a measure of grain surface area and the finer the grain size the higher the Blaine index. Generally a higher Blaine Index will deliver better pelletising properties. Hawsons high Blaine Index is achieved with little energy and reflects the natural size distribution of the magnetite within the ore. Typically others have to grind their ore much more to reach this grain size *Source, Lab and company data*

This chart shows that the exceptional Supergrade feed, when added to others improves the strength. It also reduces the amount of binding agent required. *Source Lab Data*

**Iron making properties**



The parameters above are related to efficient iron making in a blast furnace. Supergrade performs very well on all factors. High numbers are preferred for reducibility index while lower values are preferred in softening and melting, reduction swelling and degradation indices. Addition of Supergrade into the China 1 blend significantly improves China 1 performance.

***Why pellets?***

Pellets in blast furnaces allow for more predictability in steel making, thereby generating higher productivity and lower costs. Typically blast furnaces have around 5% to 15% of the total feed as pellets, with some modern plants closer to 30%.

Direct reduction iron is used as feedstock for electric arc furnaces, the most efficient form of steel making. Direct reduction is only possible with very high grade feeds because it is not able to remove slag efficiently.

The data shown are some of the key factors in explaining why high quality products can secure significant premiums to the market price for 62%Fe fines, the so called "value in use". It also demonstrates why iron makers will favour some products over others.

The value in use reflects higher productivity and lower pollution levels that are an increasingly important consideration to steel makers. Some value in use estimates for high grade magnetite suggest over USD\$30/t above the 62%Fe index price and another USD3.50 for every \$10/t CO<sub>2</sub> price (Mouton and Edwards, Iron Ore 2015 Conference Perth).