Resources Limited

17th September 2019



# OUTSTANDING COMMISSIONING RESULTS AND PILOT PLANT UPDATE

## Key points

- Outstanding purity and consistencies achieved from variability test work during commissioning trials for pilot plant.
- Results exceed targeted 4N grade.
- Pilot plant commissioning is progressing positively and already proving valuable in respect to the improvements in process flowsheet development and engineering design.
- Excellent process chemistry and kinetics demonstrated supporting FYI's innovative process design.
- Pilot plant objective is to validate the HPA flowsheet for technical and economic purposes.
- Functional testing to be performed to check for accurate process operation and scale up factors.

FYI Resources Ltd **(ASX: FYI)** is pleased to announce the results of the Company's high purity alumina (HPA) pilot plant commissioning and variability test work of key apparatus.

## Trial commissioning and feedstock variability test results

As a component of the commissioning phases of key equipment in FYI's HPA pilot plant circuit, additional test work was conducted on the Cadoux feedstock to ascertain the processing effects of variable grades, deleterious material, etc across the Reserve. A matrix of feedstock types was tested for characteristics and grade through the key pilot plant equipment as part of the commissioning exercise.

The final calcined products from all ten Variability Composites (VC) samples were submitted for high level Glow Discharge Mass Spectrometry (GDMS) analysis at EAG Laboratories in New York, USA for independent, high accuracy, confirmation of product grades (accuracy to 4 decimal places).

The GDMS results indicate all ten composites achieved high purity alumina above 99.995%$Al_2O_3$ (targeted grade was 99.99%$Al_2O_3$) with final product assays ranging from **99.997%** to **99.998%** $Al_2O_3$.

Final GDMS assay results indicate that a consistent product grade can be achieved with significantly variable feed inputs into the process. In addition to this, the range of impurities detected was minimal with only 10 impurity elements being detected via GDMS.

This is an excellent result and precursor to the continuous commissioning testwork due to commence shortly.

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**Independent EAG laboratories GDMS results are shown in the table below:**

| Composite Sample # | GDMS $Al_2O_3$ % | Variable feedstock source Cadoux kaolin project | Composite Hole ID |
|---|---|---|---|
| VC1 | 99.9976 | First 3-year Mine Plan – South, High Iron | CXRC027 |
| VC2 | 99.9971 | First 3-year Mine Plan – Central, Shallow, Low Potassium | CXRC041/042 |
| VC3 | 99.9976 | First 3-year Mine Plan – East, Deep | CXRC043 |
| VC4 | 99.9981 | First 3-year Mine Plan – Central | CXRC045 |
| VC5 | 99.9972 | First 3-year Mine Plan – North, Shallow | CXRC057/058 |
| VC6 | 99.9977 | First 3-year Mine Plan – North, Deep | CXRC057 |
| VC7 | 99.9977 | Very Deep, Low Aluminium, High Potassium | CXRC046 |
| VC8 | 99.9977 | High Aluminium, Low Iron, High Titanium | CXRC040 |
| VC9 | 99.9977 | First 3-year Mine Plan – Central, Deep | CXRC042 |
| VC10 | 99.9975 | High Titanium | CXRC039 |

Commenting on the pre-commissioning HPA analysis results, FYI Managing Director, Roland Hill, said "To achieve grades of this calibre is outstanding in light of the outcomes we were anticipating from this study. We really tried hard to stress test the project feedstock as well as the process flowsheet and pilot equipment, however the results are indeed a great accomplishment and demonstrate how effective and efficient our process is.

The most encouraging aspect of these results is the positive implications for the outcome of the continuous pilot plant trial production that is due to commence shortly. The trial production will really be put in the spotlight and if the results approximate the grades achieved in the commissioning and variation study, we will be very pleased."

**Commissioning of pilot plant and equipment**

FYI's flowsheet design for HPA production utilises standard, off-the-shelf, plant and equipment. However, the Company's innovative advantage is in the flowsheet design and sequencing of the of the process. FYI's pilot plant has completed construction and is currently being commissioned as a small-scale continuous production facility. In its pilot phase of testwork the plant will be operated to conceptually test FYI's flowsheet, and the various components that make up the engineered design, in order to replicate full-scale production.

FYI's metallurgical project manager, Independent Metallurgical Operations (IMO), is finalising systematic commissioning of the individual components of the process design to ensure that all aspects of the flowsheet and equipment work correctly ahead of the continuous pilot trials.

The commissioning phase is effectively the process of planning, testing, adjusting, verifying, troubleshooting and training of all the various individual apparatus and elements of equipment used in the pilot plant individually and then as an entire flowsheet to provide a facility that operates as a fully functional system as per the project design and requirements and to improve plant efficiency and best operating practices and to ensure safety.

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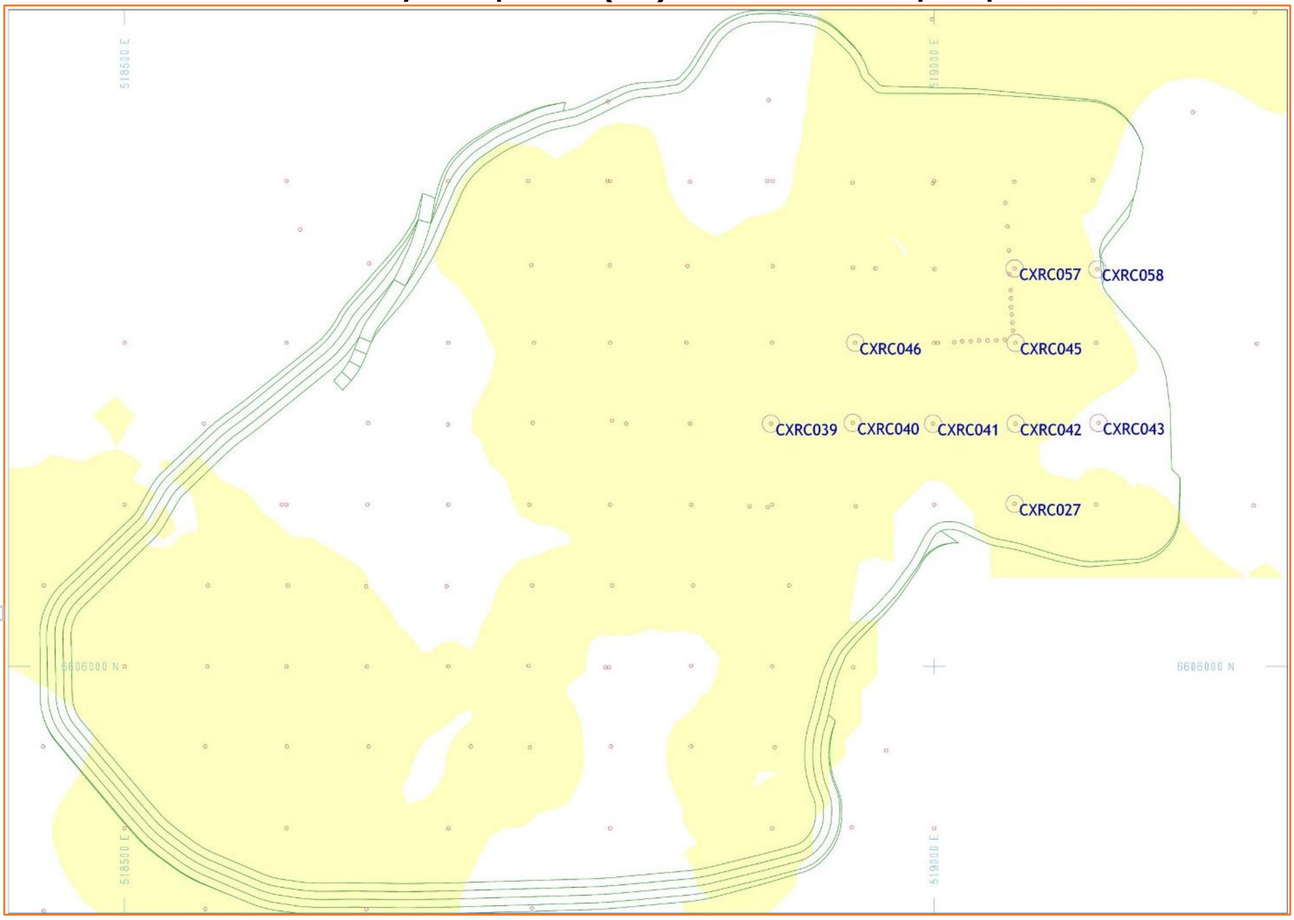
During the construction and pre-commissioning phases of the pilot plant, the study managers have encountered several critical challenges in the process characteristics and material handling performance of the HPA material that in ordinary circumstances would have a material impact on the process efficiency. These results will be incorporated into the pilot plant testing with the expectation of making a positive impact to the proficiency and economics of the project.

The pilot plant is scheduled to commence continuous production and product trailing as soon as practical once IMO provides sign-off on the commissioning and is targeting the end of November and first week of October.

The end product (HPA) resulting from the pilot plant will be forwarded to selected potential customers for their internal quality and application qualification testing.

**Collar locations for Variability Composites (VC) testwork for FYI's pilot plant**



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## About FYI Resources Limited

FYI's is positioning itself to be a significant producer of high purity alumina (4N or HPA) in the rapidly developing LED, electric vehicle, smartphone and television screen as well as other associated high-tech product markets.

The foundation of FYI's HPA strategy is the superior quality aluminous clay (kaolin) deposit at Cadoux and positive response that the feedstock has to the Company's innovative and integrated processing flowsheet utilising uncomplicated moderate temperature and atmospheric pressure technologies. The strategy's quality attributes combine resulting in world class HPA project potential.

FYI is progressing positively with its definitive Feasibility Studies (DFS) and pilot plant production studies supporting a planned production of 8,000 tonnes per year of 4N and 5N HPA.

## Competent Persons Statements

**Metallurgy**

The information in this report that relates to metallurgy and metallurgical test work is based on information reviewed and compiled by Mr Daryl Evans, a Competent Person who is a Fellow of the Australian Institute of Mining and Metallurgy (AusIMM). Mr Evans is an employee of Independent Metallurgical Operations Pty Ltd, and is a contractor to FYI. Mr Evans has sufficient experience that is relevant to this style of processing and type of deposit under consideration, and to the activity that he has undertaken to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves". Announcements in respect to previous metallurgical results are available to view on the Company's website at www.fyiresources.com.au .

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# JORC Code, 2012 Edition – Table 1

## Section 1 Sampling Techniques and Data

| Criteria | Commentary |
|---|---|
| ***Sampling techniques*** | Drilling sampling was previously reported *(ASX: 9.7.2018)*.<br><br>Metallurgical test work applied to the recovered drilling samples is intended to determine aluminium leach and precipitation characteristics of the kaolin. Sample preparation and metallurgical test work was performed by Independent Metallurgical Operations Pty Ltd (IMO) in Perth, Western Australia. |
| ***Drilling techniques*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Drill sample recovery*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Logging*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Sub-sampling techniques and sample preparation*** | Drilling sampling was previously reported *(ASX: 13.3.2019)*.<br><br>The sampling techniques for the metallurgical test work was in line with industry standards in determining composite samples representative of the resource. This included drying and splitting of individual samples and then compositing into representative samples.<br><br>The sampling procedures were under the control of qualified and experienced IMO employees and considered adequate for the intended metallurgical test work.<br><br>Master composite samples were prepared representing the Cadoux resource with alumina feed grades ranging from 21.5% to 21.2% but with variable deleterious materials to test the upper limits of the flowsheet design.<br><br>The composites underwent a stage of attritioning with the products screened to generate fine and coarse size fractions.<br><br>The fine attritioned product underwent one stage of calcination to convert kaolin clay to metakaolin. The calcined product was leached with hydrochloric acid at temperature.<br><br>The leach liquor underwent a series of precipitation stages, involving hydrogen chloride gas being sparged through the leach liquor allowing the precipitation of solid aluminium chloride.<br><br>Conversion of the final solid aluminium chloride to alumina involved a two-stage calcination process with the final product achieving ranges from 99.9971% to 99.9981 % $Al_2O_3$ purity.<br><br>Sizes and representative nature of the samples is considered appropriate. |

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| Criteria | Commentary |
|---|---|
| | All procedural work and preparation was conducted under strict controls and supervision. All testwork was conducted under test conditions by qualified and experienced technicians and overseen by qualified managers including Mr Alex Borger and Mr Daryl Evans (Independent Metallurgical Operations Competent Person). |
| ***Quality of assay data and laboratory tests*** | Analysis for the leach test work was deemed appropriate for the detailed test work as it was undertaken in laboratory environment with precision equipment and included worldwide accepted controls.<br><br>Metallurgical reviews and testwork has been overseen and approved by Mr Alex Borger – Metallurgical Project Manager and Metallurgical Competent Person – Mr Daryl Evans. |
| ***Verification of sampling and assaying*** | The metallurgical test work was supervised by suitably qualified personnel under laboratory conditions.<br><br>Primary data is captured on paper in the laboratory and then re-entered into spreadsheet format by the supervising metallurgist, to then be loaded into the company's database.<br><br>No adjustments are made to any assay data. |
| ***Location of data points*** | All samples used in the metallurgical test work have been accurately recorded by the laboratory technician and checked by the supervising metallurgist. |
| ***Data spacing and distribution*** | Industry standard sample distribution and source material representation methodology has been applied. |
| ***Orientation of data in relation to geological structure*** | Industry standard sample distribution and source material representation methodology has been applied. The risk of sample bias is considered to be low. |
| ***Sample security*** | All samples were under supervision at the laboratory. All residual sample material is stored securely in sealed bags. |
| ***Audits or reviews*** | Mr Evans has reviewed QAQC results and found these to be acceptable. |

## Section 2 Reporting of Exploration Results

| Criteria | Commentary |
|---|---|
| ***Mineral tenement and land tenure status*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Exploration done by other parties*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Geology*** | The project area is underlain by weathered granitoid Archaean rock of the Yilgarn Granites is the likely parent material for the kaolin. Here, deep weathering of the feldspathic and ferromagnesian minerals within the metamorphosed granitic has resulted in the formation of kaolinite. There is no outcrop but recognizable granitoidal fragmental rocks are sometimes present just below surface. The crust of the overburden comprises gravel and sands over reddish to off white clay. White kaolin underlies the overburden followed by weathered, partial oxidised and then fresh ganitoids at depth. The recent drilling at the property has revealed a weathering profile which is very common in Western Australia with the granitoid rocks, deeply weathered forming a leached, kaolinized zone under a lateritic crust. Analysis at the Laboratory shows particle size distributions are typical of "primary style" kaolins produced from weathered granites. The crust of overburden |

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| Criteria | Commentary |
|---|---|
| | comprises gravel and sands over reddish to off-white clay to an average depth of 5m. White kaolin then averages approximately 16 m before orange to yellow sandy and mottled clays are intersected which are followed by recognizable rounded granitoid material. The thickness of the kaolin profile varies from less than 1m to a maximum of 28m. Fresh granitoids are found at depths of between 10 and 30m. All kaolin resources are within 4 to 11 metres of the surface. All holes are drilled vertically. Intersected kaolin thickness ranges from 4-28m. |
| ***Drill hole Information*** | Sample and drill hole coordinates are provided in market announcements. |
| ***Data aggregation methods*** | The nature of the metallurgical testwork did not require data aggregation, however all data points where noted and recorded in the appropriate data base to be used in continued test work and product development. |
| ***Relationship between mineralisation widths and intercept lengths*** | Previously reported *(ASX: 9.7.2018)*. |
| ***Diagrams*** | Project related diagrams are presented in various previous ASX announcements released to the market at the relevant time. |
| ***Balanced reporting*** | The reporting is considered to be balanced. |
| ***Other substantive exploration data*** | Metallurgical test-work is being conducted on composite kaolin samples by IMO. IMO are following a standard diagnostic flowsheet template to determine aluminium leaching and precipitation characteristics of the kaolin.<br><br>The test work involves the following procedure of composited kaolin samples of the latest drilling program (see FYI ASX announcement dated 9th June 2018)<br><br>The sample was calcined at for one hour to convert the Kaolin to an acid soluble species. The sample was then leached in 26% (w/w) Hydrochloric acid at 20% solids and 100°C for 180 minutes with samples being collected to provide kinetic leach recoveries.<br><br>Leach testing was conducted in a glass leach vessel containing concentrated feed sample scalped at 106 µm and concentrated industrial grade hydrochloric acid.<br><br>The high grade variable $Al_2O_3$ samples was generated by combining phase 1 precipitate solids from previous testing to determine the aluminium chloride hexahydrate crystal size.<br><br>The solids underwent additional stages of precipitation testing with intermediate Distilled Water leaches to resolubilise the aluminium chloride hexahydrate.<br><br>The HPA assays were conducted by GDMS analysis at EAG Laboratories in New York, USA. |
| ***Further work*** | Continued metallurgical variability test work through the commissioning of the Pilot Plant studies (see FYI ASX announcement 14th February 2019) and Definitive Feasibility Study (DFS) is ongoing and will be announced to the market as required. |