



8420 Channel Highway
Cradoc Tasmania

Phone (03) 62663204
Fax (03) 62663593

Email: duggans@intas.net.au
Website: www.duggans.com.au

Annual report for EL 35/2010 (Tonganah)
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Duggans P/L
8420 Channel Highway
Cradoc Tas. 7109

Prepared by D Hassell
(Dip. Applied Geology)
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Introduction

Duggans P/L is involved in exploration activities within Tasmania for high grade silica.

EL 35/2010 was taken up to investigate the potential for a high grade silica resource contained within the tailings of previous mining for kaolin.

While this is the primary objective, the tailings are also being evaluated as a potential raw material in the production of porcelain/ceramics and for use as a supplementary cementitious material in the cement/concrete construction industry.

A copy of the Location Map for EL 35/2010 is appended

Statement of exploration philosophy and objectives

This EL has been taken up to investigate potential uses for tailings from previous mining and processing of kaolinite. The conventional exploration activities associated with a greenfield site are therefore not entirely applicable.

The 'ore bodies' are defined and exist as partly processed material.

The nature of the materials of interest are known and most of the 'exploration' activity will focus on more accurately defining the minerals present as well as their proportions and processing techniques to provide products of best value.

Two grades of tailings have been identified;

Coarse tailings consisting of silica crystals nominally 2 to 6mm in size and

Fine tailings consisting of -2mm material.

Both of these grades contain remnant kaolin and feldspar. The coarse tailings have been dumped as dry stockpiles while the fine tailings are contained within a bunded pond structure having been pumped into it as a slurry.

Any subsequent mining activity will not conform to conventional operations as it will be confined to the tailings dump areas and importantly, in the case of the fine tailings, will be conducted within an already bunded area which will prevent escape of kaolin rich run off to the wider environment.

The EL is being explored primarily for its potential to provide a resource of high grade silica although it is probable that, if processing the tailings from previous mining for kaolin is feasible from the point of view of deriving high purity silica, then a kaolin rich by-product will probably also be a saleable commodity and potentially a raw material for production of porcelain/ceramics or for the production of metakaolin (a supplementary cementitious substance of high value in the concrete industry).

The tailings are considered to be a superior source of high grade silica when compared with naturally occurring silica sand because the tailings have been mined from weathered, or hydrothermally altered, Devonian granite in situ so that the silica component of the material dumped as tailings is composed solely of quartz crystals whereas naturally occurring sand is highly likely to be contaminated by other detrital particles included during the weathering and transport processes.

It is envisaged that any subsequent reclamation and processing of the tailings will give rise to two or more economically viable products and result in a zero waste operation.

To date work has concentrated on the potential silica resource primarily in the coarse tailings although work has taken into account the fact that the silica in the fine tailings is more likely to be present as discrete particles and therefore require little or no attrition to remove remnant kaolin.

Site review

The site may be defined as the operational area, both mining and processing, occupied in the past by Associated Pulp and Paper Mills Limited (APPM) in the extraction and processing of kaolin for use as a paper filler.

A site review was carried out to identify the locations of the tailings dumps and pondages.

Summary of work completed

- Literature research including APPM exploration and mining records as well as documented mineralogy of the kaolin product produced.
- Reserves have been estimated at around 3mill tonnes of silica contained in both the coarse and fine tailings.(This is considered to be an underestimation based on known mined volumes verses kaolin produced and the fact that tailings were known to be deposited in worked out pits)
- Surface samples of both materials were taken for washing and initial analysis,(Ref appendix 1 'Elemental analysis results')
- A series of 10 hand auger holes were drilled across the fine tailings dump,(Ref appendix 2 'Location of sample sites'), to determine variability of the material while it was assumed that the coarse tailings would be relatively consistent in nature.
- Samples of three identified types of fine tailings material were subjected to XRD analysis to determine distribution of quartz and kaolin in each, (Ref appendix 3 'XRD analysis of silica tailings')
- XRF analysis of crudely washed samples of coarse tailings gave a result of +99% silica, (Ref appendix 4 'Silica upgrading trials'), and 'in house' treatment has determined that the coarse tailings silica particle size needs to be reduced to less than approximately 1.6mm to release all of the adhering kaolin.
- ICP analysis of a clean sample of coarse tailings was carried out to check for impurities at ppb levels, (Ref appendix 5 'ICP analysis results')
- Microscopic petrology of coarse material was undertaken to determine contaminant mineralogy, (Ref appendix 6 'Contaminant mineralogy')
- Mineralogical examination using SEM techniques, (Ref appendix 7 'SEM analysis of quartz sample'), has been carried out on a clean sample of coarse tailings to determine the nature of impurities and inclusions within the quartz crystals. No free non-quartz grains other than potash feldspar were observed.

Inclusions are rare with potash feldspar and zircon (containing hafnium and uranium) being identified but the abundance of these inclusions is so low that they are considered insignificant for most uses of high grade silica. A light brown film on fracture planes within the grains has not been identified.

- Preparation of 'Summary and directions' paper for guidance of the project.
- Initiated marketing research for potential high silica products

Regional exploration activities

Because of the focus of the work ie tailings dumps, there were no regional exploration activities.

Prospect based activities

Prospect based activities have been confined to limited sampling of the tailings and laboratory scale evaluation of their mineral composition with a view to methods of separating these components to provide materials of value.

The quality/purity of the quartz crystals has also been investigated by various means.

Analytical results appended may be considered to relate to random sampling of both coarse and fine tailings as nominated in the results. The actual locations of these samples was not recorded because we are dealing with processed material not related to original in-situ geology. Auger holes were drilled only to assess variability of the fine tailings dump. Samples from these holes may be bulked for other testing at a later date

Environmental considerations

Both the mining and production areas of the past operations of APPM have been rehabilitated at great expense and most of the area is now reminiscent of park land with regenerated land forms, drainage control and individually planted seedlings providing the now mature vegetation cover.

The focus of Duggan's activity is solely the tailings dumps and there is no intention of disturbing any of the rehabilitation away from these dumps.

Initial small scale sampling of these dumps has been undertaken in sympathy with the rehabilitation and the surface restored to present levels.

If there is a future larger scale sampling regime required, similar protocols will apply and if eventually a mining operation is proven viable then the mining will be confined to the tailings dumps and will proceed under the Development Proposal and Environmental Management Plan approved for the mining lease.

Conclusions

Results of work to date continue to support the probability that a high grade, consistent quality silica concentrate could be produced from the tailings. The achievement of this is more dependent on the mineral separation technology employed rather than the quality of the silica itself. Various analytical results show the silica grains to be relatively free of impurities of consequence.

The potential for portions of the tailings to be utilised as the basis for the production of ceramics or for the remnant kaolin to be used, after calcining, as a supplementary cementitious material is yet to be substantiated.

Proposed work for the next 12 months:

As explained above the conventional progression from exploration to mining has been short circuited in this case. The nature of the 'ore' is known as are target markets for any products produced.

Further work will seek to establish more accurate market values for the potential products and, depending on the results of this, prioritise product development. Production processes for selected products will be developed at laboratory scale and end products tested for quality. This is especially necessary in the case of metakaolin and ceramic raw materials involving the use of kilns and subsequent testing at laboratory scale in the concrete and ceramics industries.

In the case of the ceramics industry the primary aim is to produce ceramic grinding media.

In the case of the concrete industry the primary aim is to produce standard test cylinders incorporating various proportions of metakaolin to test for various properties of high strength, high resistance concrete.

Further efforts will be made to produce a very high grade silica resource with the aim of producing 99.99% silica.

Given encouraging results in this work it is likely that an extension to the EL will be applied for to incorporate areas of kaolinite already identified but as yet unmined.