



Executive Summary

MAGINDUSTRIES CORPORATION

*Phase I Bankable Feasibility Study
for two modules of 580,000 tonnes
per year potash plant in the Kouilou
region of the Republic of Congo*

March 2006, M102294



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EXECUTIVE SUMMARY

MagIndustries Corporation (MagIndustries) is planning the development of a potash production plant to be located near the village of Mengo, 15 km north-east of Pointe-Noire, in the province of Kouilou, Republic of Congo. GENIVAR was awarded the contract to conduct a Bankable Feasibility Study for this potash plant and, in parallel the mandate for the site selection survey, to determine the optimal plant site, and the Environmental Impact Assessment. This document has been prepared as means of verifying the viability of the project prior to the completion of the BFS. The potash plant design is based on the use of brine obtained from solution mining of a local carnallite deposit as raw material.

The site selection survey evaluated five sites located in the Pointe-Noire area, in Kouilou province. The different site options and site-related infrastructure variants were assessed with regards to the site-related costs, both financial and environmental. It was concluded that the Mengo plateau is the best site for the construction of a potash plant and in a later phase for a magnesium plant.

MagIndustries Corporation awarded a contract to MESSO/Ercosplan to carry out testwork, design the crystallisation process and prepare a capital cost estimate for the crystallisation area. GENIVAR prepared and issued requests for quotations for major utility plant packages, including the gas turbine, steam plant and all other required equipment which was not in the crystallisation scope of work. In order to determine the costs for equipment installation, piping, electrical and instrumentation supply and installation, as well as civil and structural supply and installation, it was decided to request this information from contractors who are aware of the prices for labour and materials applicable to Pointe-Noire, Republic of Congo. The most capable contractors were found to be in South Africa and Group Five of Johannesburg was then given the mandate to provide this part of the estimate.

A process design optimisation exercise to increase plant capacity yielded non-selective hot solution mining as a process alternative that could generate significantly more product for only a small increase in capital cost.

A redesign of the crystallisation process by MESSO/Ercosplan confirmed that the hot solution mining would increase the production to 580,000 tpa with less than a small increase in the capital investment. Work was thus carried out by GENIVAR to adapt the utilities to the new process requirements and also, to adjust the price of the other systems that had previously been estimated for a 400,000 tpa plant by Group Five and other vendors.

The plant was then designed for having 2 modules of 580,000 tonnes per year each for an overall production rate of 1.16 million tonnes of potash. The following tables show the solvent and brine flows as well as the utility requirements for a 580,000 tpa capacity.

Table 1: Raw material

Raw Material	Flow (m ³ /h)
Solvent	583
Feed Brine	806

Table 2: Utility requirements

Utility	Consumption
Electricity	28 500 kW
Natural Gas ¹	20 530 Nm ³ /h
Process Water	653 m ³ /h
Cooling Water	19 861 m ³ /h

¹ Annually 159,100,000 Nm³/a.

Through preliminary market information, it was determined that the majority of the product should be made in granular form. The final product distribution, which was used for the feasibility study, is presented in Table 3.

Table 3: Product distribution

Compound	Production (t/a)	Granulometry
Standard KCl	48 000	0.3 mm
Granular KCl	532 000	3% > 4 mm
		2 mm < 92% < 4 mm
		5% < 2 mm

The process design is based on a raw material analysis from a single well drilling campaign performed in the previous project phase. Currently the project is focused on drilling new commercial and exploration wells to prove the reserves, and better determine the composition of the raw material.

In performing a Phase 1 report, it was decided to put together an interim capital cost estimate that provides the client and potential investors with a preview of the BFS results to be completed at the end of phase II.

The capital cost for the base case 580,000 tpa potash plant has been estimated to be \$412 million dollars. This cost is inclusive of all infrastructures and indirect costs required for the project, as well as 5% for unforeseen items, but does not include any contingency.

The capital cost for an additional module, for a total capacity of 1,160,000 tpa potash, has been estimated to be \$281 million dollars. This cost is inclusive of all infrastructures, and indirect costs required for the project, as well as 5% for unforeseen items, but does not include any contingency.

Four (4) cash flow models were prepared with Module 2 being constructed at the same time as Module 1, and up to 3 years later, to see the effect of this on IRR and NPV. These models all use the same main assumptions which can be viewed in section 12.

The results from the cash flow analysis showed that all 4 models provide for interesting returns on investment, given the assumptions used. The analysis also shows that model 1 which combines both 1st and 2nd production modules in one project timeline has the most interesting returns.

A sensitivity analysis showed that the variables sensitive to the IRR are; drilling price, percent equity and capital cost, in decreasing order. NPV exhibited sensitivity to drilling price, product price and capital cost, in decreasing order. Drilling price in both cases has been identified as the most sensitive variable.

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In performing the Phase 1 BFS for the MagIndustries Kouilou potash plant, the project team has not encountered any impediment to continue with the work to complete the BFS. From the economic evaluation, it is clear that the returns for the project justify this continuation. Although the capital estimate shows a sizable project, the revenues easily justify the expenditure and furthermore, the market can easily absorb the increase in capacity.

The following steps are therefore recommended to be taken by the project team in the next quarter:

- Complete the drilling activity and seismic survey needed for determination of ore quality as well as the reserve estimation.
- Sign gas off-take contracts with suppliers to ensure energy supply to the plant
- Ensure use of the Mengo plateau as well as dockside area for installation of the plant.
- Identify potash process technology providers and initiate negotiations with these parties.
- Identify an EPCM contractor that is capable of carrying out a project of this magnitude in this remote location.

After these steps are completed, full basic engineering of the plant leading to a financial close can be initiated.