INVESTIGATION OF ORE PROCESSING TO RECOVER URANIUM CONCENTRATE FROM SANDSTONE OF PA LUA AREA ON SCALE OF 2 TONS OF ORE PER BATCH

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INTRODUCTION

The successful recovery of uranium from ore requires a sequence of activities. The study on hydrometallurgy must be begun with laboratory studies to provide data for selection and definition of ore processing method and for preliminary evaluations of the economic feasibility of the provided technological solution. After that the process flow sheet needs to be checked, improved and refined through testing on larger scale.

This study was carried out to test and continuously improve the proposed technological flowsheet on scale of 2 tons of ore per batch.

RESULTS AND DISCUSSION

Based on the laboratory results a system for testing on scale of 2 tons of uranium ore per batch including following parts was established (Figure 1):

- Equipment for Crushing and Grinding
- Equipment for Acid Leaching
- Equipment for Impurity Precipitation and Filtration
- Equipment for Yellowcake Precipitation, Filtration and Drying

The results of testing by 2 tons ore per batch scale has shown that uranium recovery in the leach circuit were achieved of at least 90% under following conditions: the supplying rate of leach agent 50- 70 l/m^2h, sandstone is mixed or incubated with acid before the percolation.

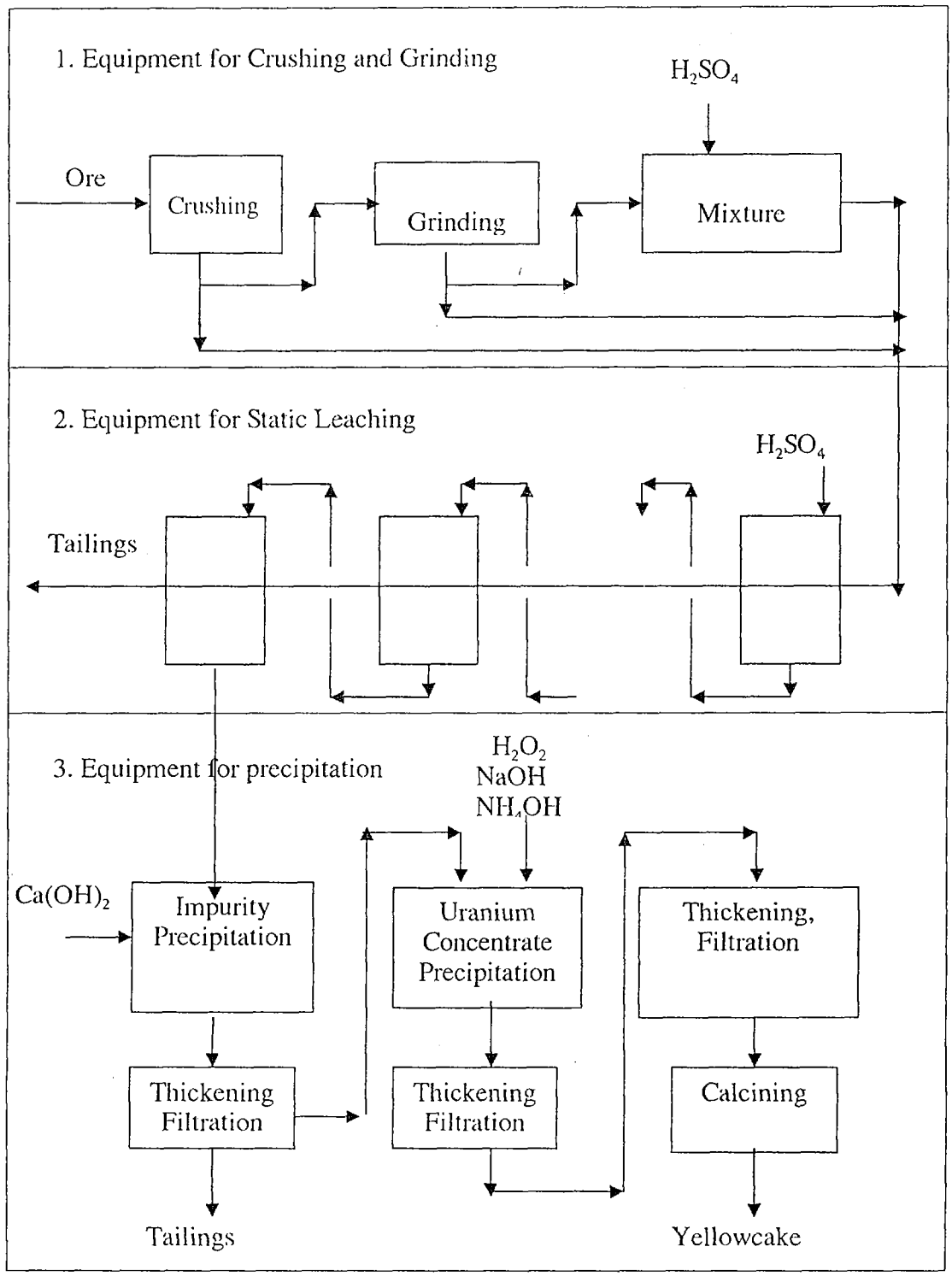

Figure 1. Schematic diagram of the testing flow sheet on 2tons of ore / batch scale

After leaching the leach liquor was oxidized to convert all ferrous ion to ferric before entering the iron precipitation circuit. By the impurities precipitation-redissolution circuit the uranium content in tailings was reduced down (Table 1).

Table 1. The loss of uranium in tailings by impurities precipitation

Iron precipitation circuit	Uranium content in tailings (%)	Loss of uranium in tailings (%)
- Precipitation at pH 4,2	1,332	9,93
- Precipitation at pH4,2 and Redissolution at pH3,5	0,760	5,68
- Precipitation at pH3,6 and Redissolution at pH2,2	0,087	0,65

About 23 kg filter cake per m^3 solution were disposed as tailings. Flocculant N101, A101 (TOAGOSEI, Japan) were used for improvement of filtration and washing capacity of impurities precipitation (Figure 2).

Uranium peroxide was precipitated with addition of hydrogen peroxide. The underflow solids were filtered and calcined. The product contained min. 76% U_3O_8.

The water recycle was successfully tested. That results in minimization of water addition to only 0,3 m^3/ton of ore.

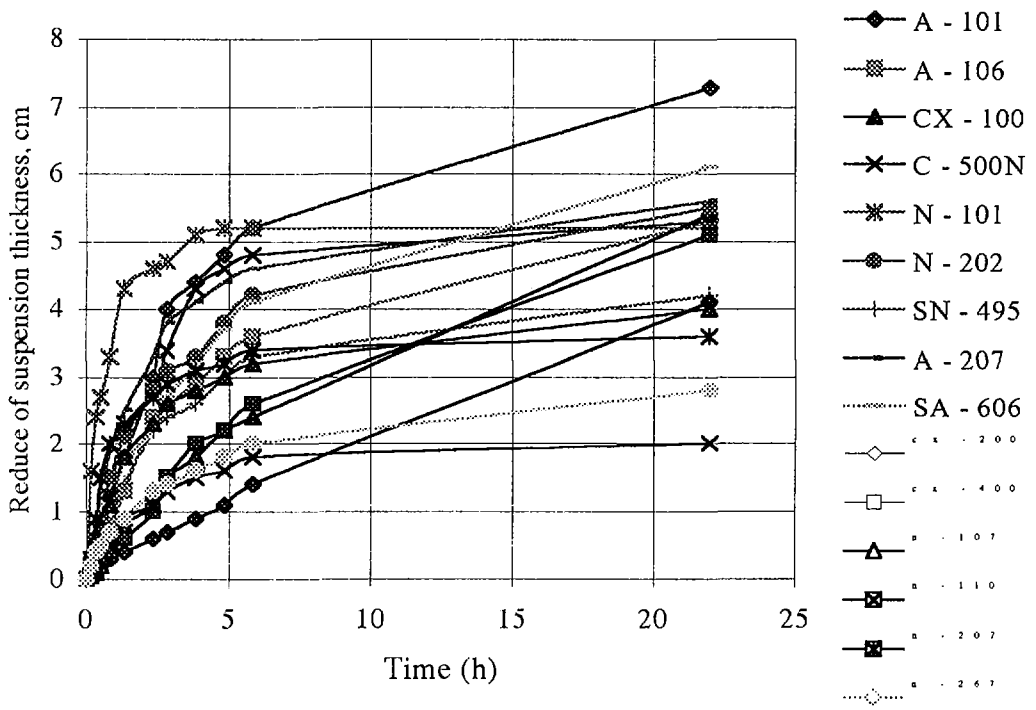

Figure 2. Reduce of suspension thickness by using Flocculant

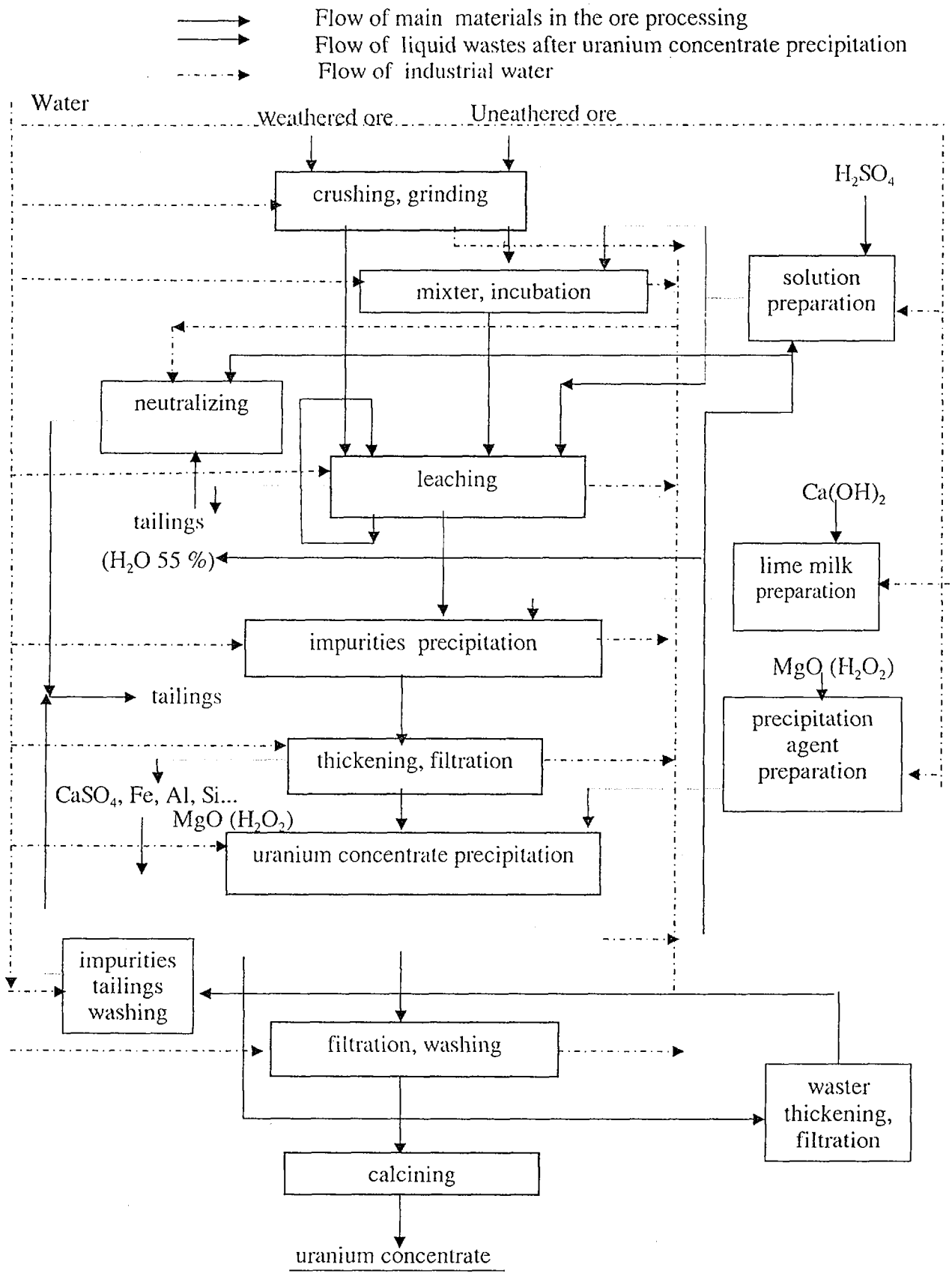

Figure 3. Water recycle flow sheet

CONCLUSION

Experimental results on 2 ton scale showed that the proposed processing flow sheet using direct precipitation can meet all environmental and technical objectives.

REFERENCES

1. *Cao Hung Thai*, Study on Processing Technology to Recover Uranium from Pa Lua (Nong Son Basin, Quang Nam) Ores, Research Report, VAEC, Hanoi 4/2000.
2. *Cao Hung Thai*, Investigation to Accomplish Technological Circuit of Processing Uranium Ores in Pa Lua- An Diem Area, Research Report, VAEC, Hanoi 3/2001.
3. *Manual on Laboratory Testing for Uranium Ore Processing* (Technical reports series No, 313 IAEA Vienna, 1990).
4. Guidebook on Design, Construction and Operation of Pilot Plant for Uranium Ore Processing, Technical Reports Series N^0 314, IAEA, 1990.
5. Quan, C,H,, Ring, R,J,, Macnaughton, S,J,, *Environmental Design of a Uranium Mill*, International Symposium on the Uranium Production Cycle and Environment, 2-6 October, IAEA, Vienna, 2000.
6. Smirnov U.V., Efimova J.I., Skorovarov D.I., Ivanov F., *Gidrometallurgitreskaia Pererabotka Uranorudnovo Suria*, Moskva, Atomizdat 1979.