

Curriculum Vitae

Sten Johansson – Principal Process Engineer



Profession:

Process Engineer

Education:

- Diploma in Mining and Metallurgical Engineering, Skellefteå Senior Technical College, Skellefteå, Sweden, 1964.
- Chemistry 101,102,103 and Geology 101,102,103
- University of South Africa, 1975.
- Management Accounting Course, Wits Business School, 1991.
- SEM 1 Management Course, 1982.
- Member, South African Institute of Mining and Metallurgy.

**Registrations
Affiliations**

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Specialisation

Process engineering and operation, design and operation of process and beneficiation plants for iron ores and vanadium, phosphate ores, base metals, gold, heavy minerals, chrome, steel and stainless steel production.

Recent and current activities include mining feasibility projects, reviews in support of CPR and due diligence work as well as trouble shooting in operational plants.

Expertise

Sten has spent his entire career in process engineering since 1966. Experience includes design, research, operations, project management and consultancy in a broad selection of metals including iron ore, vanadium, lead, zinc, copper, gold and uranium. Sten has particular expertise in pelletizing and SAG milling applications. This experience has been applied in studies conducted in Europe, South Africa, Ukraine, Brazil, Italy and various sub-Saharan African countries.

The following are key areas of expertise:

- Iron ore processing



- SAG milling applications
- Pyrometallurgy and pelletizing
- Steel and stainless steel making
- Ferrochrome and ferromanganese production
- Vanadium production
- Base metal floatation
- Phosphate flotation
- Hydrometallurgical processes including leaching, ion exchange and solvent extraction
- Heavy minerals recovery
- Sten has extensive experience in the operation of smelter plants over a variety of products.

Employment History

2002 – 2013	Principal Metallurgical Consultant	Independent Consultant
1996 - 2002	Process Consultant	Columbus Stainless Steel
1986 - 1996	Process Engineer & Consultant	Columbus Joint Venture
1985 - 1986	Consulting Metallurgist	Samancor Ltd. - Chrome Division
1979 - 1985	Head Metallurgical Engineer	Gencor Group Research Laboratory
1977 - 1979	Plant Metallurgist	Randfontein Estates Gold Mine
1976 - 1977	Plant Metallurgist	Golden Dumps
1974 - 1976	Research Metallurgist	Union Corporation Research Laboratory
1968 - 1974	Research Engineer	Granges Mineral Processing Laboratory
1966 - 1968	Research Engineer	LKAB (Sweden)

Key Experience

- Technical scoping and costing of a processing plant for a phosphate project in Norway. The ore also contain ilmenite and magnetite which was assessed as possible bi-products.
- Monitoring of the Northland Iron Ore Project, Sweden for progress and cost control on behalf of the bankers. Process plant area.
- Process Design and costing of the Mkhombi Mining Cascades Iron Ore Project in Mpumalanga.
- Process Design and costing of the Ferrex PLC Malelane Iron Ore Project in Mpumalanga.
- Technical review of all Xstrata ferrochrome and vanadium smelters.
- Independent review of DFS documents (process plant areas) for an expansion project of a major platinum producer in Zimbabwe.
- Assessment of a gold plant operation in Botswana and recommendation of improvements and possible changes required for change of ore from oxide to sulphide ore.

- PEA for Duyker Eiland Phosphate scoping study.
- Insurance assessment for Machadodorp ferrochrome plant and Kato Ridge ferromanganese plant.
- Metallurgical part of a preliminary feasibility study for a gold mining project in South Africa.
- Assessment of status of abandoned project for copper/cobalt recovery in an African country.
- Due Diligence on a copper mine in Africa.
- Scoping study for a metallurgical plant as part of an iron ore project in South Africa
- Due Diligence on a Ferrochrome Plant in South Africa for prospective buyer.
- Metallurgical adviser to the owner's team doing a PFS for a Ferrochrome Plant in China.
- Scoping study of four prospective phosphate deposits in South Africa. This was done in two stages. First stage was evaluation of the four deposits from available data and recommending the best deposit for further work. The second stage was the preliminary evaluation of the Duiker Eiland prospect to obtain an indication of the potential as a viable project.
- Due diligence of a uranium project in Namibia.
- Specifying and preliminary costing a sinter plant for a manganese project in South Africa.
- Leading an investigation into the best option for sulphur capture from the BCL smelter in Botswana for the European Commission.
- Due diligence on a Gold Recovery Plant in Ghana.
- Engaged by a Japanese /Korean consortium for a due diligence of a Brazilian company mining and processing iron ore. This included due diligence of two existing plants and evaluation of two new projects for concentration of medium grade itabirite to a high grade concentrate as well as evaluating the properties of pellets produced from such a concentrate.
- Reports (43-101) for the Canadian Stock Exchange, metallurgical chapter, for miscellaneous Brazilian and North American Projects iron ore projects.
- Investigating processing possibilities for a limonitic type iron ore from Kazakhstan.
- Contribution to conceptual flow sheet and costing of metallurgical plant for conceptual study of Ferrexpo's Galeshne deposit in Ukraine.
- Engaged by SRK, Denver to take part in a review of four iron ore projects in Brazil. The responsibilities included reviewing metallurgical testwork and proposed flowsheets as well as already ongoing operations and as a competent person editing the metallurgical section of the 43-101 Reports.
- Plant review and high level capex and opex estimates for the refurbishing of the magnetite processing plant at Nova Mine, Ukraine.
- High level cost estimate for a magnetite process plant in Poltava, Ukraine.
- High level cost estimate for Twistdraai gold project including lay-out, capex and opex.
- Investigation into the cause of a fire at the solvent extraction plant at Konkola Copper Mines, Chingola, Zambia.
- Assessment of milling layout using existing mills at lower tonnage for a gold mine in Ghana.

- Due diligence exercise for prospective bidder for iron, steel and vanadium works in South Africa.
- Due diligence of Severny Mining and Processing Works owned by Open Joint-Stock Company “SevGOK”, Krivoy Rog, Ukraine. The responsibilities included reviewing the present process plants regarding present assets and performance, ongoing investment plan and the strategic plan 2005-2015.
- Operational performance intervention for SMS Demag, Genoa: Inmetco process. The pellet production during earlier trials did not reach the projected capacity of the plant and the task was to resolve the problem.
- Commissioned by Uddeholm Technology to investigate the pollution impact from a Granshot iron granulation plant on the water circuit at Saldanha Steel, South Africa. A sampling programme was carried out over a period of time, the results were analysed and the mass balances for the main possible pollutants were calculated and summarised in a report.
- Commissioned by IMS, South Africa, consultancy design, erection and commissioning of a steel plant waste smelting plant at Columbus Stainless, South Africa.
- Consultant, Process Technology, Columbus Stainless. This position was as a full-time employee of Columbus Stainless.
- Administrate the completion of the Technology Supply Contracts with Krupp Thyssen Stainless, Nisshin Steel and Uddeholm Technology. The contracts with KTS and Nisshin were completed and closed.
- Modelling plant throughput based on equipment design capacities and plant experience for planning of the production build-up to be included in the five-year plan; Columbus Stainless.
- Define shortcomings in the processes and carrying out feasibility studies, recommendations and motivations for board decisions. Some of the equipment motivated and installed including additional slab grinders, additional cut-to-length line and a heavy plate cut up line.
- Define and recommend future expansions. This includes development of flow sheets, recommendations of new equipment, estimations of operating cost and capital cost and a cash flow analysis to prove the viability.
- Direct implementation of an Environmental System that meets legal requirements.
- Process Engineer / Process Consultant for the Columbus Joint Venture Expansion Project.
- Techno/economic comparison study between building a new stainless steel plant or to expand facilities at Middelburg to 500 000 tpa slab capacity rolled to hot or cold rolled coil. Value of the final expansion US\$1,000 million.
- Coordinate input from technology suppliers (Thyssen, Nisshin, Uddeholm), Project Engineers and Plant Management to define the scope of the project and choice of processes and equipment.
- Senior member of the team finalizing the feasibility study for Board approval followed by vendor negotiations, choice of vendors and final contract negotiations.

- Arranging training at the Technology Suppliers plants and coordinating the Technology Supply teams during commissioning was also a major responsibility as part of administration of the contract.
- Scope definition for the BPEO (Best Practical Environmental Option) and negotiating contracts for supply of process gases.
- Assistant Consulting Metallurgist/Consulting Metallurgist at Samancor Ltd., Chrome Division. Projects included plants for Chrome and Manganese smelters. Part of the duties was also the Langphos mine in the Saldanha Bay Municipality in Western Cape. The tasks included the process optimisation of the plant for producing a suitable phosphate product for the fertiliser market.
- Development of projects to improve processes and products in the fields of concentration, pre-treatment (agglomeration, roasting, pre-reduction, preheating), smelting and refining. Projects outside the chrome recovery included heavy minerals from sand, titanium pigment, nickel, iron, zinc and phosphates.
- R&D projects in precious and base metal processing. Supervising a department of 25 including eight graduates and five technicians. Some of the processes included were flotation of base metals (zinc, lead, copper), leaching and recovery of gold (especially the CIP process), magnetic recovery of iron (both low intensity for magnetite and wet high intensity for hematite) and gravity separation. Crushing and milling was always part of the investigations. Autogenous milling for quartzitic gold ores was a specialty for the company.
- Operations Metallurgical Manager, Grootvlei Mine. Responsible for the gold recovery process plant.
- Assistant to Group Consulting Metallurgist Office. Compile chapter on carbon-in pulp in the SAIMM published book on the Extractive Metallurgy of Gold in South Africa. Main achievement was the development of a computer model for the carbon-in-pulp process for application in the group.
- Plant Metallurgist at Randfontein Estates Gold Mine.
- Part of the team commissioning the Cooke Plant. Some responsibilities included commissioning and optimising throughput and recovery of gold and uranium, establishing and running a metallurgical accounting system for the gold and uranium recovery and responsible for the dispatch of gold bars to Rand Refinery and yellow cake to Nufcor.