



PROFILE & CAPABILITIES



Company Profile & Capabilities

TZ MINERALS INTERNATIONAL (TZMI) is an independent specialist consulting and publishing company, established in 1994, with offices in Australia, the US, Europe, South Africa and China. TZMI is comprised of four operating divisions and subsidiaries, providing specialist services to the following industries :

- Mineral sands and zircon
- Titanium dioxide pigment
- Iron ore and ferrous alloys; and
- Specialty chemicals for the global paints and coatings industry.

Two associated companies in which TZMI has a shareholding provide ancillary services to these industries and augment the offerings of TZMI's other divisions are :

- Allied Mineral Laboratories (AML), providing testwork, product assessment and flowsheet development for mineral sands, iron ore and other heavy mineral deposits; and
- Ferrum Consultants, market consultants in ferrous metallics.

The TZMI team have decades of cumulative production and consulting experience across the commodities value chain, from resource estimation to divestment. This depth of our skills enables TZMI to provide advice ranging from high-level strategic M&A decision support to operationally-focused plant optimisation. TZMI also has a high level of experience in conducting a range of scoping and feasibility studies incorporating mining, processing and beneficiation up to and including basic engineering for use in IPO's and private equity raising. This work is usually supported by detailed market studies completed by TZMI.

TZMI's expertise and knowledge has been developed from the direct involvement of our team in production, chief executive, senior operational, analytical and marketing roles, combined with significant consulting experience to numerous corporations globally.

These varied consulting assignments enable TZMI to maintain an active dialogue with existing and potential participants in the industry and to keep fully aware of new developments. To ensure TZMI provides accurate and up to date advice, our research analysts maintain the most comprehensive and current databases of industry production, market information and best practices in the world, including supply/demand models, technical data and operating cost data for all major producers.

TZMI's Publications and Data Services support the consulting activities, maintaining our consultants' awareness of the industries in which we operate and providing clients with a range of authoritative data and informed commentary on all aspects of these industries.

From a free weekly news service to sector-specific periodicals and data matrices, multi-client studies and annual industry reviews, TZMI offers a comprehensive suite of products and subscription options suitable for all industry participants, from Board level to technical services.

Consulting Services

TZMI specialises in confidential consulting services across all aspects of the global titanium and zirconium industries including heavy minerals deposits, recovery and processing of mineral sands, TiO₂ pigment plants and titanium sponge production.

TZMI provides commercial and strategic advice to many varied industry participants, including banks and financial institutions. TZMI's involvement, advice and consulting capabilities include :

Competitive Cost Analysis

TZMI has developed a proprietary methodology that allows for a realistic comparison of projects with widely differing product profiles, as long as a consistent approach to costs is adopted. The methodology has been applied in a number of confidential assignments for existing producers and potential new entrants to assess competitiveness and to provide benchmarking criteria.

Due Diligence

TZMI has carried out a number of due diligence studies and independent expert reports for both existing feedstock producers and potential new entrants. Clients include: Tigor, Southern Mining Corporation, Southern Titanium, Westralian Sands Limited and RGC Limited. Recently, TZMI managed the due diligence process for a client interested in purchasing Nissho Iwai's Australian mineral sands assets.

Industry Analysis

TZMI has completed a number of assignments that focus in detail on aspects of the TiO₂ pigment industry, including analyses of pigment production costs and the markets for specific pigment grades.

Market Assessments

Since its inception in 1994, TZMI has been preparing long term projections of supply and demand and price forecasts, for a wide variety of clients. These studies have been prepared on a confidential, single client basis for specific purposes and are additional to the more general industry data presented in TZMI's publications. Clients include: Namakwa Sands, BHP Minerals, WMC Resources Ltd, Sierra Rutile Limited, BeMaX Resources NL, Iscor Limited and Kenmare Resources.

Case Study

TZMI was approached by a potential new entrant to the industry to conduct a technical due diligence of a major, undeveloped mineral sands deposit. This involved a preliminary resource assessment, mineralogical and metallurgical investigations, confirmation of potential product quality and an assessment of the strategic merits of the deposit. TZMI assembled a team of experienced sub-consultants and completed the due diligence exercise in just five weeks. As a result, our client decided to proceed with the purchase of the deposit, which has subsequently been the subject of extensive project feasibility studies, for which TZMI continues to provide significant technical advice.

Case Study

TZMI was requested by a feedstock supplier to undertake an analysis of specific, nominated pigment plant production costs to enable a better understanding to be gained of the competitive position of the feedstock supplier's products. TZMI engaged the services of a sub-consultant with experience in pigment plant operations to provide specific input to the study, which was completed to the client's satisfaction.

Case Study

A major mining group, considering investment in a new titanium feedstock project, requested TZMI to prepare a long term supply/demand analysis for titanium feedstocks at an early stage in the feasibility study for the new project. This analysis included an assessment of forecast product prices. Subsequently, TZMI was requested to update the analysis at regular stages throughout the study to ensure that the market forecasts continued to support the need for new projects.

Mergers and Acquisitions

TZMI has carried out numerous studies, independent expert reports for both industry participants and potential new entrants, as well as for other titanium feedstock and pigment transactions. Significant projects include:

- Cristal acquisition of Millennium Chemicals, acting as the Independent Industry Expert for Cristal and HSBC bank
- Representing a private equity client in reviewing the sale of European TiO₂ plants
- Kumba (now Exxaro) acquisition of Ticom, acting as the Independent Industry Expert for KPMG and Ticom independent shareholders
- Private equity acquisition of Johnson Matthey Zircon/Ceramics assets
- Ticom acquisition of interest in Iscor Heavy Minerals; and
- RGC-WSL merger to form Iluka Resources.

Numerous other significant studies have been carried out but remain confidential.

Project Development

TZMI's experience in the evaluation of new projects includes assessments of potential products, including quality requirements, likely consumers, product pricing and market entry strategies. TZMI assists clients in developing potential projects by providing assistance with scoping studies, pre-feasibility studies and bankable feasibility studies. TZMI also provides management of process testwork and flowsheet development, leading to estimates of capital and operating costs. Of increasing interest to the proponents of new projects is TZMI's ability to provide a realistic assessment of cost competitiveness compared to both existing producers and other potential new projects.

Case Study

On behalf of a potential new entrant to the industry, TZMI managed a pre-feasibility study of a project based on an undeveloped resource in a potentially new area for mineral sands production. TZMI managed the resource assessment, using local geological consultants, conducted mineralogical investigations in Australia and managed a programme of metallurgical testwork at Australian laboratories. Based on the results of the testwork, TZMI prepared indicative estimates of operating costs and assessed the marketability of products and their potential prices. As a result, the project economics were shown not to be sufficiently robust to warrant proceeding with more definitive studies.

Technical Consulting Services

With its large and diverse operating experience across nearly all titanium mineral and pigment operations around the world, TZMI and its subsidiary companies are in a position to efficiently identify areas for improvement in the areas of cost, quality and throughput and can assist with :

- Flowsheet Development;
- Physical Separation Testwork;
- Resource Assessments;
- Technical Reviews and Audits;
- Benchmarking exercises; and
- Economic evaluation of projects.

Database & Publications

TZMI's Publications and Data Services support the consulting services and provide clients with a comprehensive range of authoritative data and informed commentary on all aspects of the titanium minerals, zircon and TiO₂ pigment industries.

Full time research staff are engaged in the collection, analysis and distribution of data. A comprehensive computerised database is maintained, including regularly updated supply/demand models and operating cost data for all major producers.

TZMI's publications include :

- Monthly publication of production, trade and market data, supplemented by detailed annual reviews and market forecasts (Mineral Sands Annual Review, Mineral Sands Report, Pigment Annual Review and TiO₂ Pigment Industry Report);
- Quarterly price forecasts (Pigment Price Forecast);
- Comprehensive reports on specific aspects of the industry, including multi-client studies addressing supply/demand fundamentals of the titanium feedstock industry, zircon, ilmenite, relative economic values of feedstocks and comparative cost studies of feedstock producers (Industry Reports);
- Comparative Cost Studies and Trade Matrices;
- Customised key industry data reports, tailored to specific needs (Data Services);
- Weekly updates on latest developments within the industry (Industry News); and

All publications can be ordered directly from the TZMI website at www.tzmi.com

Key Personnel

Eric Bender *BS, Chem Eng*



Eric joined TZMI in July 2009 to develop business in the Americas region as well as add to TZMI's technical and business capabilities. Eric holds a Bachelors of Science degree in Chemical Engineering from Mississippi State University. He is based in the United States (Tennessee).

Prior to joining TZMI, Eric worked for Eastman Chemical as a Corporate Strategy Manager, responsible for developing business- and corporate-level strategies at the company. Eric's TiO₂ pigment experience came from Tronox, where he held numerous positions from Engineering to Strategic Sourcing to Business Development / M&A.

Barend (Ben) Coetzee *M Eng MBL*



Ben joined the global TZMI team on a full-time basis in May 2006 as the TiO₂ Pigment Specialist, working for TZPI. He is based in Durban, South Africa. He has a Bachelors degree in Electrical & Electronic Engineering, a Masters degree in Electrical Engineering and a Masters of Business Leadership.

Ben enjoyed an extensive career with Huntsman Tioxide spanning more than 12 years. In 1992, he joined the Tioxide JV at its South African TiO₂ plant holding various operational positions including Engineering Manager, Works Manager and Business Development Manager, before becoming Capital Manager for Tioxide's global TiO₂ business.

Gavin Diener *BSc Eng BCom*



Gavin joined TZMI as a senior consultant in May 2008. Since graduating from the University of Natal with a Bachelors degree in Chemical Engineering he has enjoyed a 16 year career in the Anglo American Group, working in mineral sands, gold and iron operations. He joined the Namakwa Sands project in 1993 and has been involved in both the smelting and minerals processing aspects of the business. His final position at Namakwa Sands was the Operations Manager responsible for the mineral separation business unit.

Gavin has technical, management and business skills gained through experience in plant operation, pilot plant test work, plant design, plant commissioning, process optimisation, business analysis, operations management and product development.

Steve Gilman *BappSc, FAusIMM, MAIME*



Steve has had a diverse career in the minerals processing industry which, in addition to the mineral sands industry, has included experience in copper smelting, lime and cement manufacturing industries. The emphasis in his career has been in mineral sands operations. Since his employment at Allied Eneabba Limited as a metallurgist in 1976, Steve has had senior roles including General Manager for RGC's operations in Florida, General Manager of the Eneabba operations, and Group Operations Manager for RGC Mineral Sands Limited. Steve joined TZMI as a Principal Consultant and Director in 2000.

Key Personnel (continued)

Machiel Keegel MSc



Machiel joined TZMI in November 2007 to build its global technical arm in the pigment sector and develop relationships with European clients. Machiel has a Masters of Science specialising in Raw Materials Engineering, from the Delft University of Technology and has worked in the TiO₂ pigment industry for Kemira, Kerr-McGee, Tronox and Tiwest. Machiel's main responsibilities have been in plant production including output, quality, cost, safety and environmental performance. He is a key contributor to the TZMI's pigment publications.

Galvin Lim B Eng Electrical & Electronic Engineering, PhD Electrical Engineering



Galvin joined the TZMI team in 2010 after 5 ½ years with Deloitte Consulting, spending 2 of those years in the London practice. Galvin's consulting experience spans a wide range of projects including project management, business process re-engineering, system implementation, cost review, business case development, gap analysis and benchmarking.

David McCoy B Chem Eng, M Eng Mngnt, CP Eng, PE



David has been involved in the mineral sands and TiO₂ pigment industry since 1997 in Western Australia and the US. He joined TZMI in June 2004 and uses his experience to manage and consult on a wide variety of pigment related projects and TZMI's pigment publications. He has a degree in Chemical Engineering from Curtin University of Technology, Western Australia as well a Masters of Engineering Management, with a major of International Finance.

David has worked in the mineral sands industry for RGC (now Iluka Resources) and Tiwest in process engineering, technical and engineering services roles. He has also had experience working in business management and global supply chain functions as a Senior Business Analyst with Kerr-McGee Chemical LLC in Oklahoma City USA.

Zayn Marlowe BSc Eng (Metallurgy and Materials Engineering: Extraction Metallurgy)



Zayn joined TZMI in 2007 after starting his career in South Africa at Richards Bay Minerals. Zayn has extensive experience as a Process Metallurgist across smelter and iron processing plant operations with Richards Bay Minerals and is now a key contributor to TZMI as a Data Analyst and Metallurgical Consultant.

Key Associate Consultants

Peter Broadbent (Consulting Engineer, ex HBH Consultants)

Mike Brown (Paint & Coatings Consultant, ex Quaker Chemical Corp)

Kurt Faller (Ti-Metal Consultant, ex TIMET)

Pat McManus (Consulting Engineer, ex Corvette Resources)



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Philip Murphy BSc (Hons), MSc, GDE (Mineral Economics)



Philip has a background in economic geology and mineral economics. He was a highly regarded commodity/mining analyst based in Johannesburg, specialising in titanium minerals and other industrial minerals, before joining TZMI in March, 1999.

Philip graduated from the University of Natal in 1986 and spent five years working for Gencor and the South African Department of Mineral and Energy Affairs. His main areas of expertise are in studying trends in commodity markets using fundamental supply/demand analyses; preparing industry research reports on the titanium minerals sector; and the financial analysis of mining companies.

Grant Ribbink BSc (Hons) MCSE GAICD



Grant is an experienced professional services director and executive manager who recently joined TZMI as our General Manager. He started his career in geology, working in gold and base metal mining and exploration and diamond exploration before discovering a passion for business leadership. Over the last decade, Grant has held various senior management and board positions in information technology and intellectual property professional services firms.

Troy Thompson BE (Chem Hons) BS (App Chem)



Troy graduated with a Bachelor of Engineering (Chemical) (Hons) and Bachelor of Science (Applied Chemistry) from Curtin University of Technology in 2002. He joined TZMI in 2007 as a Data Analyst and Metallurgical Consultant after having spent the previous five years at mining operations in Western Australia which included experience in nickel flotation, smelting and metallurgical accounting.

Gang (Laurence) Wang B Eng



Laurence's industry stature is well known to TiO₂ market participants. He is a prominent fixture in the Chinese TiO₂ industry and often seen as the face of the industry, presenting at international conferences and facilitating business activities between the Chinese and Western industry participants. Laurence has a degree in Mechanical Engineering for Mineral Processing from Panzhuhua University and has worked for two of the leading Chinese companies for feedstock and pigment production. Laurence joined TZMI in May 2006 and is based in Chengdu, the capital of Sichuan Province.

Gavin Williams BSc Engineering (Chemical)



Gavin joined the TZMI team in August 2008 after a career spanning 16 years in the Pyrometallurgical and Heavy Minerals Processing Industry. After completing his Bachelors degree in Chemical Engineering at University of the Witwatersrand in 1991, Gavin joined the Pyrometallurgy Division at Mintek gaining considerable experience in the operation of both AC and DC electric arc furnaces. He then joined Richards Bay Minerals gaining both technical and operational experience in smelter furnaces and heavy minerals processing. Gavin was involved in overseeing operations activities at the smelter, services and molten products transfer areas before going on to manage metallurgical development work spanning from the mine through to final products.