

Merker Mineral Processing

R. Gerhard Merker – Aufbereitungsingenieur (MMP)

(Mineralische Rohstoffe, Beratung, Aufbereitung, Recycling, Projekt-Management)

R. Gerhard Merker - Mineral Processing Engineer

(Mineral engineering, Consulting, Processing, Recycling, Project management)

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R. Gerhard Merker - Raw materials

(sourcing of primary and secondary raw materials)

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Merker Mineral Processing

Consulting for:

- **Mineral engineering,**
- **Recycling,**
- **Sourcing,**
- **Project Management,**

Merker Mineral Processing

On the basis of my professional senior expert knowledge, I offer my services as a consultant of the following business fields:

Primary and Secondary Mineral Resources, Industrial residues and Beneficiation tailings,

- Mineral Processing, Upgrading and Recycling
- Development of Products, Processes, Applications and Markets
- Reclamation of **Aluminium Salt Slags**
- Processing, Upgrading and Use of secondary Alumina Resources
- Processing of **Rare Earths and Rare Metal ores**
- Beneficiation of Fluorite/ Baryte, Tin/ Tungsten, Lithium, Apatite, Feldspar etc.
- Beneficiation of gold and base metal ores.

Sourcing of raw materials like Alumina, mill scale, micro silica, Silicon Carbide, fly ash etc.

Your benefit arises from my package of know-how and services covering all steps of a project from the first evaluation of a resource and the development of a project up to the commissioning of the processing facility as well as the marketing and application of the products.

I offer special skills in the sourcing and supply of secondary raw materials for the production lines of cement clinker, steel slag fluxing and mineral wool in Germany, Europe and North America.

Merker Mineral Processing – professional carrier

- 1976 – 1981 **Mining University Freiberg/ Germany (Bergakademie)**, master of mineral processing engineering (Dipl.-Ing.),
- 1981 - 1990 **Mineral Raw Materials Consulting Dresden GmbH, (geological industry)** research associate and project manager,
- 1992 - 1995 **B.U.S Environmental Services (Berzelius- Umwelt-Service AG)** (*plants of processing and recycling of residues from the metallurgical industry*) **Project engineer and project manager,**
- 1996 - 2003 **Aluminum Salt Slag Reclamation Hanover und Luenen (ALSA GmbH)**(*worlds biggest treatment and recycling plants of salt slags from Aluminium dross and scrap re-melters*) **Project manager, head of Alumina sales and process development,**
- 2004 - 2005 **Recyclage d'Aluminium Québec Inc. Becancour/ Canada, later on ALSA Canada**(*Al-remelting and salt slag reclamation*) **Consultant and manager of Alumina marketing and product development,**
- 2005 - 2009 **Aluminum Salt Slag Reclamation Hanover, Luenen and Toeing, (ALSA GmbH, now BEFESA Salzschlacke Germany, head of application engineering and product development,**
- from 2009 on **Freelancer (R. Gerhard Merker – mineral processing engineer, MMP)**
 - consultant of raw material producers and traders, recycling and processing facilities, exploration companies etc.
 - sourcing and supply of Alumina, mill scale, Iron ore, micro silica, Silicon carbide, Silicon, Iron sulphate, fly ash etc. for portland and special cement kilns, flux blenders, mineral wool producer, etc.
 - market development and studies about secondary raw materials like Alumina, Magnesite, dross etc.
 - process development and engineering for processing respectively recycling of salt slags, Alumina, Silicon by-products, Rare Earths, Nb, Y, Tin, Li and Gold-copper ores etc.
 - consultant for processing tests of rare earth and Nb exploration projects, etc.
 - consulting with REACH- and CLP-procedures of secondary alumina, development of a product status,

Merker Mineral Processing, international experience

- **Vietnam:**

1984 – 1989, technical consulting, ore reserve evaluation, beneficiation lab. + pilot tests, FS of a green field rare earth (REE) mining project;
From 2016 on support for beneficiation studies.

- **Belgium, France, Scandinavia, Poland, Hungary, Czech, Austria, Sweden, Switzerland etc.:**

From 1994 on acquisition / customer care/ application engineering, sourcing (cement kilns, mineral wool, steel mills)

- **Norway:**

2003 permit application, plant site evaluation, planning of a brown field salt slag reclamation project

- **Brazil:**

2003 Aluminum recycling seminar in Sao Paolo,
2014/15 rare metal ore processing tests

- **USA / Canada:**

2000 - 2008 project development, salt slag evaluation + reclamation plant planning, plant site evaluation, de-bottlenecking + commissioning support, product and market development alumina,
From 2012on: consultant for metallurgical tests of REE and Nb exploration projects, commissioning support and beneficiation studies for gold-copper ore processing .

- **middle East:** from 2011 on, consulting of Aluminum dross re-melters / salt slag processors



2014



1984

MMP-
rare earth / rare metal
ores

Merker Mineral Processing,

consulting services of the rare + precious metal line

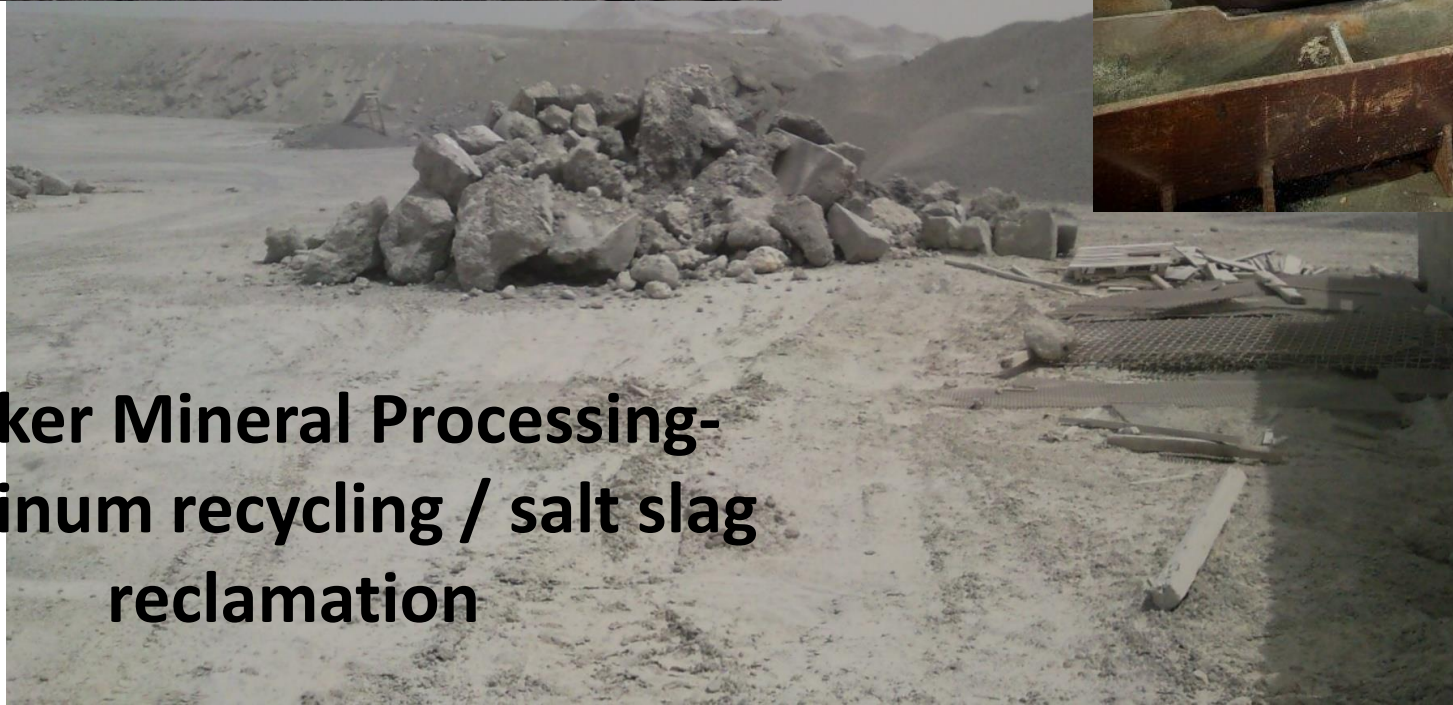
- Investigation, Characterizing and evaluation of ores and processing tails
- Beneficiation tests, Lab and Pilot scale
- Process Development , optimization and engineering
- Project development + management
- Flotation, WHIMS and other separation processes
- Carbonatite ores bearing **REE-minerals** like **Bastnaesite**, **Monazite**, **Xenotime** etc. associated with fluorite, baryte, carbonates, apatite, silicates, Fe-minerals etc.
- Others: ores of **Nb/Ta**, tin/tungsten, lithium, **gold-copper** etc.

Merker Mineral Processing,

references of the rare + precious metal line

Ore processing:

- 1980/81: Diploma thesis about flotation of poor tin ores with di-carboxylic acids at the **processing plant of Altenberg-Zinnwald / Germany**,
- 1984 - 1989: **Rare Earths Ores of Dong Pao/Vietnam:**
development of a processing technique, basic engineering, (grinding, flotation, classifying, magnetic separation, filtration, drying, acid crack of conc.), site evaluation, mine and facility planning, feasibility study for 40 kt/y throughput ,
- from 2011 on: **Rare earth ore Ashram/Eldor/Canada:**
consulting for a PFS project, development of a flotation technique for a Monazite + Bastnaesite bearing carbonatite rare earth ore, project manager of lab and pilot tests of comminution, flotation and WHIMS,
- from 2013 on: consulting for a couple of companies in north America, Germany, Brazil etc., processing tests on **Nb/Ta-ores, Y-ores, refractory REE-ores** ,
reclamation of **REE from industrial waste**, processing of **poor gold-copper** ores.



**Merker Mineral Processing-
Aluminum recycling / salt slag
reclamation**

Merker Mineral Processing, consulting services of the line of salt slag / black dross

- Aluminium- and Magnesium Salt Slags
- Investigation and Evaluation
(valuable constituents, gas creation, feasibility check of processing, etc.)
- Market Research, Business and Reclamation Concepts,
- Basic Evaluation of Slag Processing projects (PEA)
- Processing Techniques and Process Development, Operations improvement
- Project Development and Management
- Application / upgrading / marketing of oxide residues and products (!)
 - **turn residues into products**
- Off-gas treatment concepts

Merker Mineral Processing,

references of the salt slag processing line

Salt Slag processing:

- 1995 - 2009: operation of Best-Available-Technology Salt Slag treatment plants at Luenen 170 kt/y, Hanover 110 kt/y, Toeing 100 kt/y in Germany (crushing, milling, screening, leaching, oxide filtration + drying, salt crystallization, off-gas washing, fertilizer production, etc.)
- 1998 - 2003: process development and pilot processing tests on German, Canadian and Norwegian Salt Slags;
- 1997 / 1998: development, construction and commissioning of a wet milling facility (milling, screening, magnetic separation, metal drying, off-gas washing) at ALSA Luenen/Germany, 60 kt/y Al–Salt-Slag-fines input,
- 2001 - 2004 development, planning, commissioning of a slag processing plant (wet milling, screening, magnetic separation, leaching, oxide filtration, oxide curing and drying, salt crystallization, off-gas combustion, etc.) at RAQ Inc. in Becancour /Canada, 30 kt/y slag input capacity ,
- 2003 development, planning and permit application of a Salt Slag processing plant (crushing, wet milling, screening, filtration, leaching, crystallization, off-gas combustion etc.) at Hydro Aluminium in Karmoy /Norway, 50 kt/y capacity,
- 2006 - 2008 construction, commissioning and de-bottlenecking of a Salt Slag processing plant (wet milling, screening, magnetic separation, leaching, oxide filtration, oxide curing and drying, crystallization, etc.) at ALSA Sued in Toeing/Germany, 100 kt/y input capacity,
- 2009 2015: consulting for slag processors in Bahrain, Spain, Germany etc. (upgrading and marketing of oxides. de-bottlenecking of treatment plants. evaluation of slags. PEA etc.)

MMP- salt slag reclamation and oxide application

Lagerhalle Scholz-Alumina, 2013



Altlager SOD

Neuoxid Sorten S, SFO zur Auslieferung

Merker Mineral Processing, consulting services of the salt slag line – 2 (oxides)

- **Alumina Raw Materials** = Oxides deriving from Al-Salt Slag reclamation,
- Investigation and Evaluation
(grade, impurities, chances of upgrading, feasibility check of processing, etc.)
- Sourcing and Supply for users (substitution of primary Alumina-raw materials),
- Processing and Upgrading concepts,
- Market - and Business Development, contracting of clients
- Product Development and Application Engineering,
- Evaluation of Slag Processing projects (PEA)

Merker Mineral Processing, references from the Aluminium oxide line

Oxide product (NMP)

- from 1992 on: product development and upgrading of oxides (secondary Alumina) for the lines of cement clinker, mineral wool, steel refining slags, refractories, building materials, fillers etc.;
- 1995-2009: development of a market of more than 250 kt/y secondary Alumina in Germany, Europe and North America,
- from 2010 on: consulting for SAS/ ASO, head of oxide (Alumina) marketing
- 2011 consulting for ALS, oxide upgrading by calcination.
- from 2010 on: consulting for cement and mineral wool producers in terms of alumina sourcing etc.
- 2017: Basic study for technical and economic evaluation of a slag processing project.

MMP- reference list of selected clients + partners

Client / partner	land	year
Essener Erzhandelsgesellschaft GmbH&Co. KG	Germany	2009-2014
HVL GmbH	Germany	From 2010 on
ScholzAlu Stockach GmbH	Germany	From 2010 on
Holcim AG	Germany, France and CH	From 2010 on
Deutsche Rockwool Mineralwooll GmbH&Co. OHG	Germany	From 2010 on
UVR-FIA Freiberg GmbH	Germany	From 2010 on
Aalborg Portland S.A.	Denmark	2010-12
ATA Int. nv	Belgium	From 2010 on
Commerce resources corporation,	Canada	From 2011 on
Kerneos S.A.	France	From 2011 on
Dahrouge Geological Consulting Ltd.	Canada	From 2012 on
Hazen research Inc.	USA	From 2012 on
Non ferrum GmbH	Austria	2012
Helmholtz Institut für Ressourcentechnologie, Freiberg	Germany	From 2013 on
Niocorp Developments Ltd.	Canada	2014
Spenner Zement GmbH&Co. KG	Germany	2013+2014
Umwelt- und Ingenieurtechnik GmbH Dresden (UIT)	Germany	From 2014 on
Deutsche Rohstoff AG	Germany	2013/14
Confal A.S.	Slovakia	From 2013 on
Mineracao taboca S.A.,	Brazil	2014/15
Aluserv middle east W.L.L. (Harsco)	Bahrain	2011

MMP, selected papers and references

- ...Hartgesteine als unkonventionelle Feldspatrohstoffe..., (granitic rocks as non-conventional feldspar raw materials), Freiburger Fo.-hefte C399, 1984, S. 49-56
- Aufschlussverfahren von Bastnäsitkonzentraten, (chemical processing technique of Bastnaesite ore concentrates) Patent DD 262845 A1, 31.07.1987
- A processing technology for heavily weathered rare earth ores ..., 17th Int. Mineral Processing Congr., Dresden, 23-28 Sept. 1991, Preprints Vol. IV, pp. 321-330, (dito in: Erzmetall 9/91, pp 452-457),
- Geologische Situation und Aufbereitungsmöglichkeiten des Seltene Erden Erzes von Dong Pao/ Vietnam. (geology and processing of the rare earths ore of Dong Pao/Vietnam) - Erzmetall, 44(9/91): 452-457, Weinheim. Geological situation and processing possibilities of the rare earth ore of Dong Pao/ Vietnam. - In: Natural Resources and Development, Vol 37, 1993: S. 7-17,
- Herstellung v. Schmelzspinell ..., (manufacturing of molten spinel ...), Patent DE 433 30 21, 29.09.93 Bodenauskleidung f. Elektrolysezellen, (bottom lining of aluminium electrolysis cells), Patent DE 197 22 788 A1, 30.05.97 High-Alumina Secondary Raw Materials..., Tile & Brick International, Vol. 14, No. 3, 1998, S. 2-4
- Hochtonerdehaltiges Pulver, Verfahren zur Herstellung und ..., (high alumina powder, procedure for its production and ...), Patent DE 100 40 582 A1, 15.08.00 ... Tonerderohstoff aus der Aufarbeitung von Al-Salzschlacke, (... alumina raw materials from the reclamation of aluminium salt slag), Freiburger Fo.-hefte A 864, 2001, S. 107 ff.
- Porosierender, erstarrungsbeschleunigter Bindemittelbaustoff-Zusatz und Verfahren zu seiner Herstellung, (porosifying and solidification-accelerating additive for binding agent building materials and procedure of producing), 15.08.2000, Patent EP 1180504, US 6593262, etc.
- Hochtonerdehaltiger Rohstoff, Verfahren zur Herstellung und ..., (high alumina raw material, procedure of producing and ...), Patent EP 144 09 37 B1, 08.01.2004,
- Sustainable reclamation of aluminium salt slags, Vortrag auf dem "Int. Seminar of Al-recycling of ALBA", Sao Paolo, Okt. 2003,
- Verfahren zur Herstellung eines halogenarmen hochtonerdehaltigen Rohstoffs, (procedure for producing a low halogen high alumina raw material), Patent DE 102006060209 B3, 18.12.2006,
- An unconventional Al₂O₃ alternative, Industrial Minerals, Dez. 2006, S. 67-71
- ALSA are developing secondary aluminas, Vortrag auf: 13th bauxite and alumina seminar Athens 06 - 07.03. 2007,
- News from ALSA's secondary aluminas, paper of the 14th bauxite and alumina seminar Miami, March 2008,
- Hochtonerdehaltiger Rohstoff und Verfahren zur Herstellung, (high alumina raw material and procedure for its production), Patentanmeldung EP 08005328.3, 20.03.08,
- About the processing of carbonatite rare earth ores; paper of the conference on processing and recycling at UVR-FIA Freiberg, Nov. 2012
- News release of the company Commerce Resource Corp. about the beneficiation of the Ashram REE ore, Feb. 2013 on www.commerceresources.com
- About the reclamation of salt slag / salt cake / black dross (and the recycling of aluminium generally), paper of the conference on processing and recycling, UVR-FIA Freiberg, Nov 2013
- Use of virtual fractions for the MLA of low grade Y-bearing REE ores, paper 894 of IMPC, Sept. 2016 Quebec City,
- Flotation of REE-minerals from Fluorite by pH-shift; poster presentation of the "Flotation 17" conference, Capetown Nov 2017.