



# allmineral

**Efficient and low cost upgrading  
of iron ore lump and fines**

Dr. -Ing. Heribert Breuer | Dipl.-Ing. Andreas Horn

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### Abstract

Mineral processing is characterized by a constant adaptation to changing raw materials and market conditions. It is the link between the mined raw material and a marketable product. As a lot of high grade reserves are exploited, a steady deterioration of raw material quality can be observed. At the same time, the customer's requirements for product purity and consistent quality increase.

This general scenario has been well addressed in the invitation to this seminar in respect to iron ore. Over the last years beneficiation techniques for iron ore are becoming more important in order to achieve a maximized utilization of ore resources and to produce competitive products according to international standards.

Allmineral has been engaged in hematite iron ore beneficiation with its gravity separators for more than 10 years.

The delivery of jigs started in the mid nienties for the upgrading of iron ore for its utilization in a Direct Reduction Plant in Australia. Since then, various other installations with jigs for lump and fines as well as upstream seperators for fines are in operation in Australia and South Africa. Low grade run of mine and/or dump ores are being processed with alljig®- and allflux®-separators as the core equipment.

The operation experience show the specific advantages of jig application on iron ore upgrading due to the possible high gravity cuts and the easy and low cost operation.

Alljig® and allflux®, these technologies provide a value addition to the development of the Iron Ore Industry.

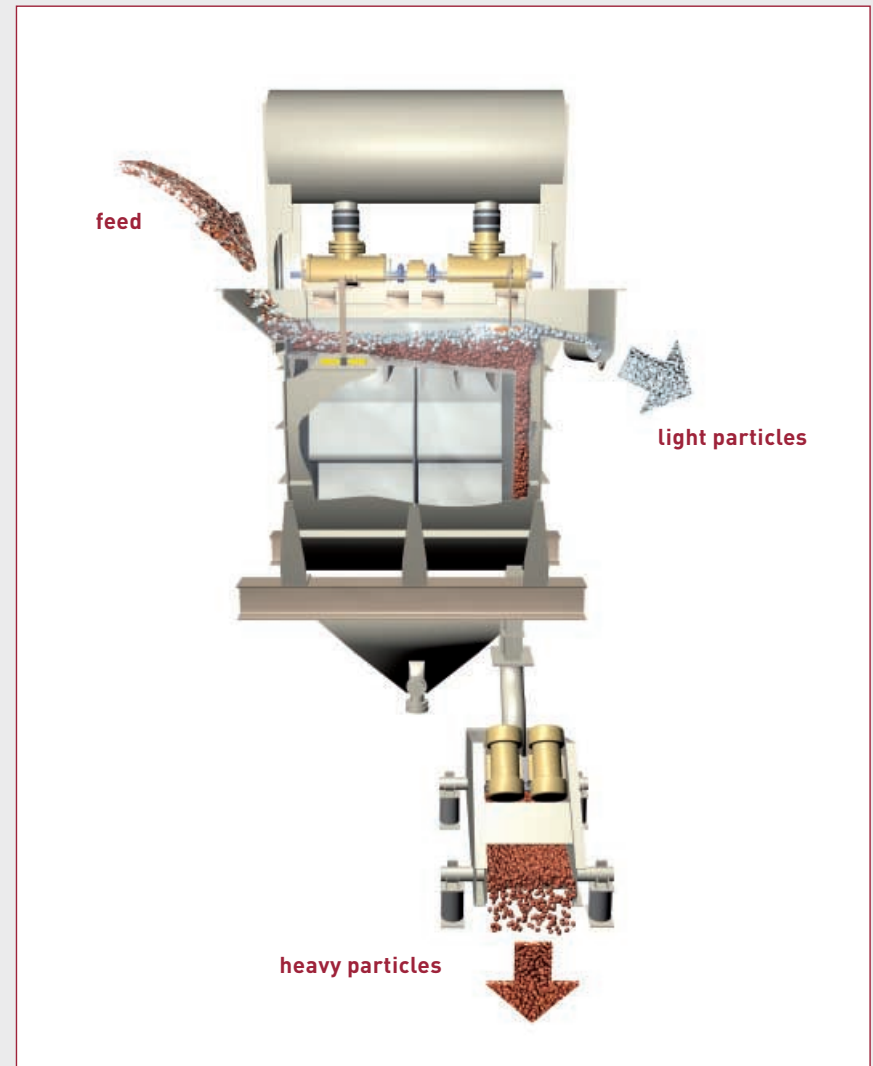


## Jigging technology | alljig®

Separation of minerals in jigging machines is based on the fact that particles will stratify in pulsating water. The upward and downward currents fluidize and compact the grains into relatively homogenous layers. Low density pieces stratify on the surface, while specifically heavy grains settle to the lower level of the bed.

alljig® jigging machines are air-pulsed, because the pulsation of the water can achieve nearly wear-free and so the stroke-motion (frequency, amplitude and shape) can be adjusted within wide parameters during operation.

alljig®-jigs are in operation for the cleaning of different raw and recycling materials. The only prerequisite is a difference in the particle density.



## alljig® applications

For

- coal
- iron ore
- sand | gravel
- rubble
- contaminated soils
- metal - slag
- non ferrous minerals
- diamonds
- salt and others



## ■ alljig® technology

- air pulsed jig with minimum energy consumption
- optimized with regards to flow pattern in the hutch
- computer simulated jigging bed movement
- jigging stroke control by rotary valves
- single or multiple stage pulsation
- fully automatic operation with analogue measurement of bed depth
- operation parameters adjustable during operation
- capacities from 150 kg|h to 700 t|h per unit
- size range of feed 0.1 to 150 mm

## ■ alljig® advantages

- high efficiency
- low maintenance
- large feed size range
- high capacity
- sharp separation
- reduced energy and investment costs
- reliability
- easy to operate

## ■ alljig® high separation efficiency

**Main criteria  
for excellent jigging results**

→ jig bed stratification

→ product discharge control

## alljig® for iron ore beneficiation

### Example 01

South Australia | Iron ore separation

1 x 100 t|h                      8 - 1 mm  
 1 x alljig®                      F 2500 x 3000  
 start up                          September 2004

1 x 120 t|h                      32 - 8 mm  
 1 x alljig®                      G 2500 x 3000  
 start up                          September 2004

### Dump material upgrading

- feed                              54 - 59 % Fe  
 - product                          62 - 65 % Fe  
 - yield                              70 - 85 %



## ■ alljig® for iron ore beneficiation

### Example 02

Western Australia | Iron ore separation

2 x 150 t/h

8 - 1 mm

2 x alljig®

FUB 3000 x 4000

start up

September 1996





## alljig® for metal - slag separation

### Example 03

Belgium | slag separation

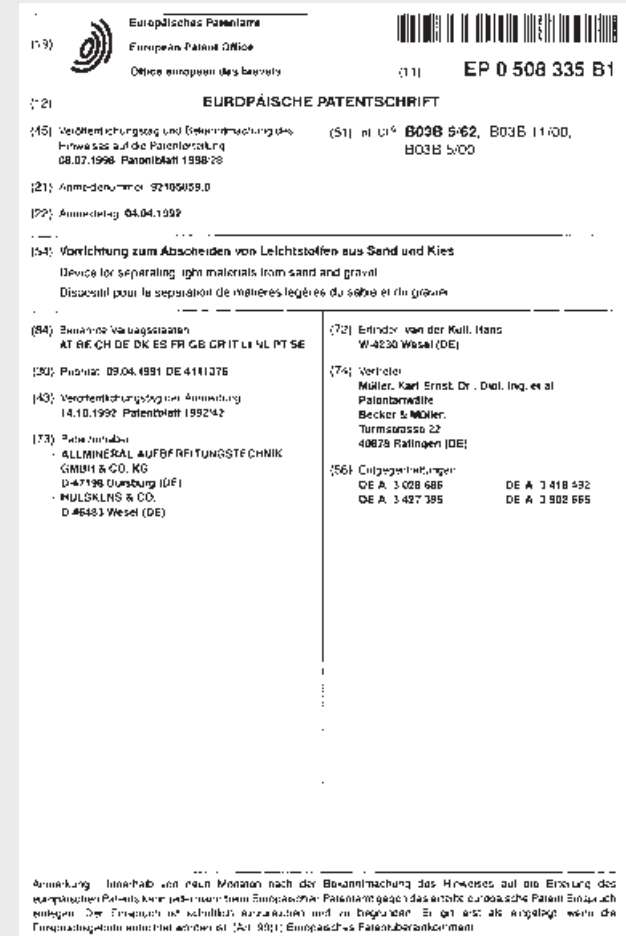
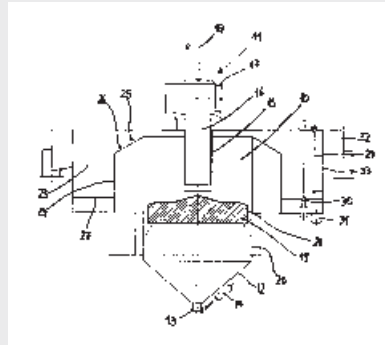
50 t/h  
alljig®  
start up

7 - 1 mm (20 - 7 mm)  
G|F 1700  
December 2002



The first idea for the **allflux**<sup>®</sup> separator was born in 1988. The patent was registered in 1990, and the first industrial unit was installed in 1991. Today more than 50 units are in operation worldwide.

Since the introduction of the **allflux**<sup>®</sup> technology to the concrete sand industry more than ten years ago, many more applications have been discovered. Fine coal recovery from ponds, iron ore upgrading, mineral sand concentration and high quality glass sand sizing are just a few examples of this unique technology.



## Advantages of the allflux®

The performance of the allflux®-separators exceeded its engineering objectives, including:

- high separating efficiency
- high capacity reaching 2.000 m³/h
- consistent high product quality
- automatic operation and control of discharge systems and water feeds
- high solids content of discharged products
- low wear
- low energy consumption

Another benefit results from the relatively independent processing of coarse and fine material. It allows either fraction to be processed or stockpiled separately, or they may be blended to meet special applications. Even with variations in raw material composition, the ability to offer a consistent product is greatly enhanced.

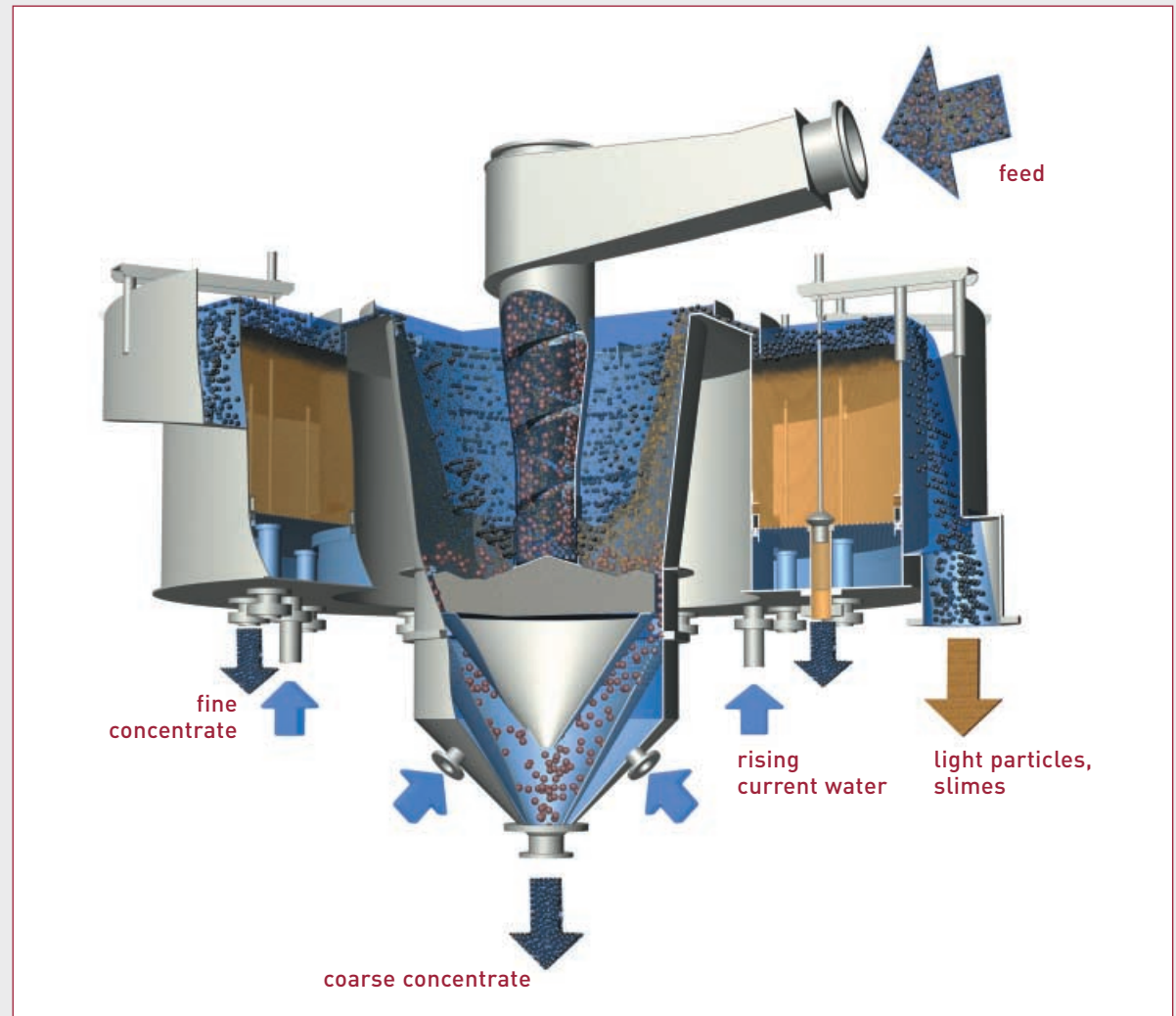


Fig. 8: allflux® during erection

Perhaps the most important advantage of the allflux®-separator is economic. By combining high efficiency and high capacity with multiple processing stages, a reduction in specific production cost is realized. Overall plant size is minimized and hence investment and operation costs are reduced. The efficiency of the allflux® extends the boundaries for feasible sand and fine particle processing, it may allow some previously uneconomic reserves to be mined.

## Technical Description

The **allflux**<sup>®</sup> separator is a round, center feed process vessel that is sized according to the hydraulic load. The process uses a unique combination of rising current and fluidized bed techniques and can be divided into three stages. The principle of an **allflux**<sup>®</sup> separator is schematically shown in the following illustration.



## allflux® technology for the beneficiation of Hematite

allmineral (Pty) Ltd of South Africa has installed three allflux® Type 1000 Up-Current Classifiers for a South African Iron Ore producer.

These units treat 180 t/h each of minus 2 mm hematite ore. The ore is upgraded to 65% Fe minimum.

The characteristics of the feed and products are;

- |                            |                         |
|----------------------------|-------------------------|
| - Solids SG                | 4.280 kg/m <sup>3</sup> |
| - Feed slurry pulp density | 1.270 kg/m <sup>3</sup> |
| - Feed slurry solids       | 28%                     |
| - Feed Fe content          | 56 - 60%                |
| - Product Fe content       | 65%                     |



**allmineral**

Aufbereitungstechnik GmbH & Co. KG

Baumstraße 45

47198 Duisburg | Germany

Telefon +49 (0) 20 66 - 9917-0

Telefax +49 (0) 20 66 - 9917-17

e-mail [head@allmineral.com](mailto:head@allmineral.com)

[www.allmineral.com](http://www.allmineral.com)

**allmineral LLC.**

Suite 1-F, 1360 Union Hill Road

Alpharetta, Georgia 30004 | USA

Telefon 770-410-0220

Telefax 770-410-0807

e-mail [allmineral@aol.com](mailto:allmineral@aol.com)

[www.allmineral.com](http://www.allmineral.com)

**allmineral Sp. z o.o**

Ul. Powstancow Sl. 5

53332 Wrocław | Polen

Telefon +48 (0) - 71 - 7837011

Telefax +48 (0) - 71 - 7804418

e-mail [biuropl@allmineral.com](mailto:biuropl@allmineral.com)

[www.allmineral.com](http://www.allmineral.com)

**allmineral (Pty.) Ltd.**

P.O. Box 73171

Fairland 2030, Johannesburg | South Africa

Telefon 011-4785380 | 81

Telefax 011-4785388

e-mail [allmin@global.co.za](mailto:allmin@global.co.za)

[www.allmineral.com](http://www.allmineral.com)



allmineral