



Owing to growing world demand for metallic raw materials, lower-grade ore deposits with a higher content of undesirable elements will be economically feasible if suitable extraction processes can be developed.

## Knowledge centre FLUBET – Fluidized bed pilot plant

In combination with the fluidized bed plant, the knowledge centre FLUBET has been established. In addition to Swerim, partners in the centre include base metals producer Boliden, LTU Energy Engineering and Process Metallurgy, and ETC – the Energy Technology Centre, which develops biomass gasification processes. The objective is to jointly create an international-calibre knowledge centre.

[www.swerim.se](http://www.swerim.se)  
[info@swerim.se](mailto:info@swerim.se)



Box 812, 971 25 Luleå, Sweden

www.konstindustri.se / Photo: Maria Astén



Fluidized bed pilot plant



**The fluidized bed process presents good potential for utilizing raw materials that have a higher content of pollutants. With our advanced pilot facility and the knowledge centre FLUBET, we wish to secure a world-leading position as a developer of metallurgical processes in large pilot scale.**

## Applications

### METALLURGY

The initial metallurgical application is pre-treatment of concentrates prior to smelting. This involves:

- drying with air
- thermal treatment (calcination)
- oxidation (roasting)
- reduction

The facility can be used for both oxidation and reduction processes. The metal concentrate can then be smelted and refined in pilot scale in Swerim's electric arc furnaces or converter.

### ENERGY

Fluidized beds are now being used in very large scale, particularly for heat and electricity production in combined heat and power plants (cogeneration). The pilot plant enables pilot-scale research towards the development of energy conversion and gasification processes. Development of new methods of heat recovery is another important area.

### RECYCLING AND ENVIRONMENT

The fluidized bed process is an interesting route for recycling various types of waste. For example, the process can be used to separate fluorides from dust and dried sludge via calcination.

### THE FUTURE

New fluid bed processes have very great potential, but more development is needed. An important area is extraction of base metals from mineral concentrates containing undesirable elements such as arsenic. Other areas are increased use of residual products from metallurgical processes, and increased utilization of residual heat from the steel, non-ferrous metals and mining industries for power and heat production or upgrading of forest biomass fuels. This technology can potentially generate considerable value in many primary industries, in the forestry industry and for energy producers.



## Technical specifications

### DIMENSIONS

Fluidizing	
inner diameter	200 mm
height	2,000 mm
Clearance	
inner diameter	300 mm
height	6,000 mm

### GAS HEATER FOR FLUIDIZING

- Synthetic air
- Nitrogen gas
- Argon or reducing gases

### MASS-FLOW-CONTROLLED MATERIAL HANDLING

- Two separate twin screw feeders
- Separate vibratory feeder for bed material

### CAPACITY

20-50 kg material/hr up to 1000°C

### CONTROLLED COOLING

The final product is cooled in an inert atmosphere.

### ADVANCED, FLEXIBLE GAS CLEANING

- Double cyclones for particle separation
- Post combustion of particulate matter
- Gas cleaning with the aid of controlled gas cooling, electrostatic filters in series, with a dry textile filter and a wet venturi scrubber and, finally, an SO<sub>2</sub> scrubber.

## The fluid bed process

In the fluid bed process, fine-grained raw material **1** meets a heated gas stream with a predetermined composition **2** for fluidising in the reactor vessel **3**.

The reaction takes place through the rapid heating up of the particles in the intensive contact with the heated fluidised sand bed, the hot gas and the hot reactor wall **4**. Fluidisation, in this case, entails the force of gravity on the particles in the bed being balanced by the upward forces of the gas stream. The system's gas and particles will, macroscopically seen, behave like a liquid.

By controlling the speed and composition of the gas, a continuous reaction and production of raw material takes place. The freeboard is equipped with a side heater to compensate for cooling loss **5**.

The reacted powder product is separated via two cyclones **6**, cooled and collected in a protective vessel outside the plant **7**.

The gas is sent via a heated afterburner **8** to a gas cooler **9** before purification and dust separation takes place in an electrostatic filter **10** and a venturi scrubber **11**, alternatively a bag filter **12**. Finally, the gas is purified of any acid gases in a wet scrubber **13**.

