

## ● R&D on High Strength Artificial Concrete Aggregate

### 1. Outline of the Project

The captioned aggregate to be developed by this R&D is produced by using coal ash as for its major material in putting about 10% of limestone powder, together with 5% of bentonite as for a binding additive, then the mixture is pelletized by a pelletizing machine to produce pellets of 55-20 mm in diameter. The pellets are heated up to 1,350<sup>0</sup>C in a rotary kiln for their calcinations during which silicate powder is splashed for the pellets to coat them as a melting proof agent, and then we can get the aggregate product.

By the introduced pelletizing and calcinations know-how in better utilizing the lightness and finer grained natures of the coal fly ash, we can expect to produce **aerated but rather rigid grains of coarse aggregate**. By establishing this aggregate producing technology, we can well cope with the resource exhaustion issues of the concrete related coarse aggregates. In other words, it would become a powerful technology, which could benefit effective coal ash utilization in the near future.

### 2. Results of the R&D

Figure 1 shows an aggregate manufacturing facility in a flow chart, and Figure 2 shows the manufactured aggregate product.

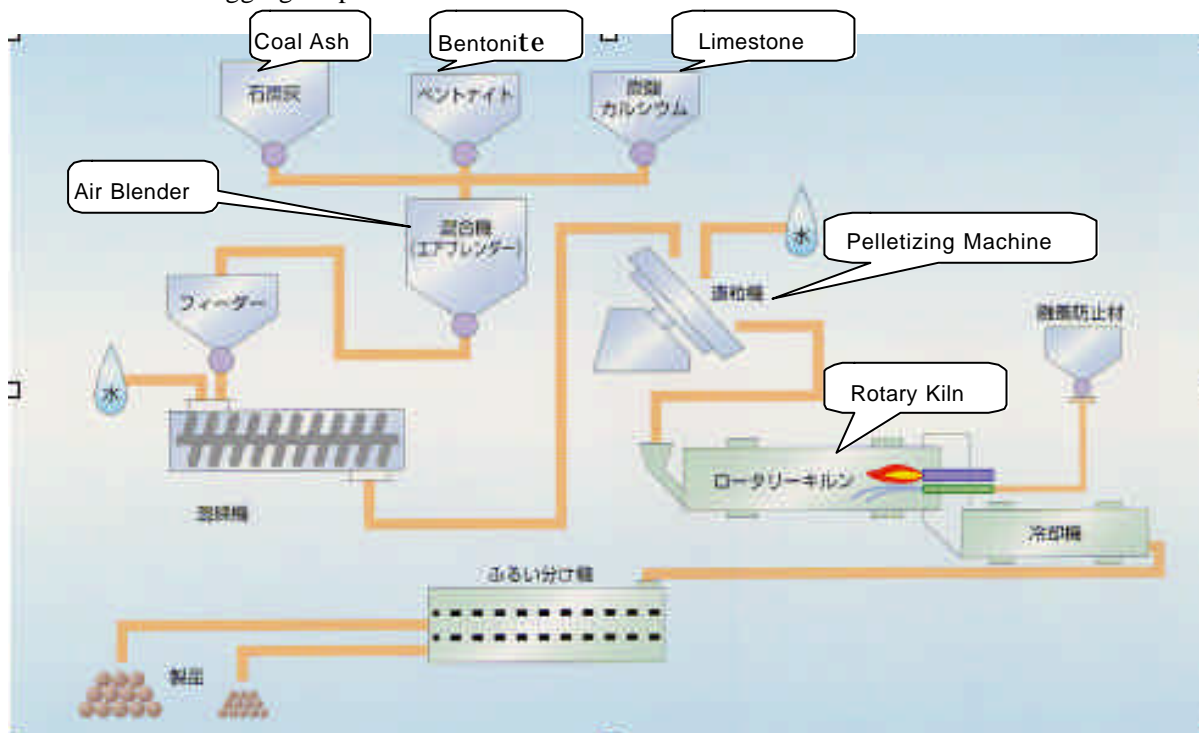


Figure 1. Manufacturing Flow Sheet of High strength Artificial Aggregate



**Figure 2. Manufactured Artificial Aggregate based on Coal Ash**

In analyzing the test results, the following facts have been found,

### **1) Characteristics of the Aggregate**

- **Unit volume mass weight is about 30% lower** than natural crushed gravels
- **Stability (on JIS A1122) is higher** than natural crushed gravels
- **Decreasing amount by abrasion is a little behind** the tested natural gravels  
(But no trouble in practical uses)

### **2) Characteristics of the Concrete blended by the coal ash aggregates**

- In comparison with the use of natural crushed gravels, the unit volume mass weight of the concrete becomes around **10% lighter**.
- On the other hand, it was found that **its strength is equivalent, or even higher** than the natural gravel blended one, both based on 28 curing day concrete strength under different cement mixing ratios, respectively.

Additionally, nowadays, by the Civil Engineering Association of Japan, a draft on “the Designing and Working Guidelines for High strength Artificial Aggregate based on Coal Ash” has been published, and its related explanatory seminar, etc. have been open in public.

**3. Cooperating Company:**

Taiheiyou Cement Co., Ltd.

**4. Schedule of R&D**

	FY1998	FY1999	FY2000	FY2001
(1) Production of Aggregates				
(2) Tests on the concrete				
(3) Study on applications				
(4) Structural Tests				
(5) Preparation of Guideline				