

## 7.5 Process Management

### 7.5.1 Overview

It is important to decrease the amount of pollutant emission at the emission source in order to control air pollution. Thus, control equipment is installed and it collects contaminants, reducing the pollutant emission volume through combustion management. In the same way, it is possible to reduce the pollutant emission volume by adopting a rational production process control. Because many kinds of production processes exist, examples of air pollution countermeasures through process control follow.

### 7.5.2 Method through Cleaning of a Workplace

It would seem that such an example as that of the 1960's would not exist in Japan at present, however, in the 1960's, a small-scale factory ran a process where 1,400 tons of a solid raw material were pulverized, in every month scattering fine particles in the neighborhood and it became a problem when the residents complained. Fine particles from the factory's crusher deposited on the floor and scattered with a concentration in the factory's atmosphere at 50-500 mg/m<sup>3</sup> near the crusher, and lowering the visibility in the factory. In this event, there was an increase in visibility by the cleaning of the deposited dust progressed. Cleaning seems to be important in the case of process control.

Many dumptrucks are taking on the haulage of earth and sand in land reclamation sites to be used for housing, land improvement sites and earth and sand excavation sites, and the environmental impact is remarkable. Then, the earth and sand adhering to the tires of these trucks during transportation are causing a scattering of dust, raising complaints along their routes. In addition, earth and sand falling onto the road from the truck beds are also scattering dust. Therefore, the dumptrucks which are departing a site are put into a shallow pool where the tires are thoroughly washed, and there are cases where efforts are being made to cover the load to prevent earth and sand from falling onto the road.

### 7.5.3 Method through Management of Raw Materials and Fuels Used during the Process

Sometimes, the clay used as a raw material at glassworks contains some fluorides which causes hydrogen fluoride emission into the atmosphere from the glass melting furnace. Therefore, the quality of the clay is controlled and clay with little fluorine content is chosen as a raw material, which should reduce the volume of hydrogen fluoride emission.

Moreover, the organic solvent which has been used to clean the painting devices after painting ship hulls in a large dockyard was thrown away. Or, there is the example where, because the amount of solvent used was more than really necessary, the amount of solvent used was decreased, thereby reducing the volume which evaporated into the air during the process.

There also is the example where the sulfur contained in the coal is controlled, by mixing of the different kind

of coal and hold the electrical resistivity of dust to the appropriate level, in order to keep the high dust collecting efficiency of the electrostatic precipitator at a high level.

#### 7.5.4 Strengthening of the Process Maintenance and Management

There are many couplers, flanges and bends as well as many control valves in the pipe system which transports volatile organic compounds. Also, pumps and compressors are necessary to transport these compounds, too, and the packing material for these connections is indispensable. However, in some cases, the volatile organic compounds evaporate through this packing material.

For example, there is data showing that an average of 0.15 g/h of hydrocarbons leaks from the pumps of a naphtha transportation pipe system and that 0.031 g/h leaks from the valves of a hydrocarbon transport system <sup>1)</sup>.

Then, it is said that this quantity of evaporation is related with the maintenance and management of these facilities <sup>2)</sup>. It is especially desirable to strengthen the maintenance and management of the packing material in these processes in order to control air pollution.

#### 7.5.5 Improving Processes

At a subcontractor factory of a semiconductor maker, a metal pieces are put in many wide-mouth beakers and concentrated nitric acid was added to each beaker and heated in order to wash. A great deal of irritative nitric acid gas was discharged from beakers and leak from the building and caused complaints. The wide-mouth beaker was replaced by a flask with a return current condenser attached, or with a conical beaker with a clock plate covering the mouth, effectively canceling the problem of condensing the cooled nitric acid vapor and nitric acid consumption decreased, too <sup>3)</sup>.

At large paint facilities, the swing angle of the paint sprayer was maintained irrespective of the size of metal part to be painted. Thus, much paint was wasted when painting small metal parts, and more of the organic solvent in the paint vaporized than necessary. Therefore, a process control system was instituted that used a light sensor to detect the size of the metal part, controlling the swing angle accordingly, and this decreased the quantity of paint used and an organic solvent that vaporized. If the spray paint process using organic solvent-based materials is changed into one using water- or powder-based paint, then the vaporization of the organic solvent will decrease <sup>4)</sup>.

#### 7.5.6 Rationalizing Processes Through Combination

There was a case where a considerable amount of black smoke was discharged because, of the two adjacent boilers, one boiler was operating in an underloaded condition and the other was in an overloaded condition. Thus, the condition of the steam supply system of the two boilers was communicated by setting of connection steam pipe between two boilers and the load was controlled, which improved this situation.

In the manufacturing process of sesame oil, there were complaints of an offensive odor. This was dealt with successfully by changing the manufacturing process to use the exhaust from sesame oil manufacturing process as

combustion air for the boiler at the factory, which canceled the complaints. This situation is similar to the example of the spray paint process where the problem was the exhaust from the paint booth, which contained organic solvent, at the car manufacturing plant<sup>4)</sup>. Considering the process and plant location, the organic solvent exhaust can be used for energy if it is burned at a electric thermal power plant, making the amount of vaporization nil.

Considering the location of a blast furnace in steel mill and cement kiln in cement factory, if both facilities can construct near, it would be easy to supply the blast furnace slag as water dross in order to mix cement clinker. And blast furnace cement can manufacture double amount of cement clinker burned by rotary kiln in cement factory. Thus, the increased cement production is attempted and the basic burning fuel unit can be reduced.