

## Chapter 7 Air Pollution Control Technology

### 7.1 Basic Ideas Behind Air Pollution Control

#### 7.1.1 Overview

Reducing the emission of air pollutants into the atmosphere is indispensable for air pollution control. Many technologies are applied toward this purpose and the technology for the collection and treatment of pollutants such as dust collector and exhaust gas desulfurization and denitrification equipment is spreading widely. However, these are not the only means of air pollution control. Among many other control techniques are the improvement of fuels, combustion management, energy saving and process control, as mentioned later. The basic ideas employed by these techniques toward the air pollution control described here.

#### 7.1.2 Basic considerations on air pollution control

It is sometimes possible to control the amount of air pollutant emission through rational management of the production process as follows. There are many cases where pollutants are emitted into the atmosphere, because the process management is improper, so it is desirable to check first about whether or not the production process is rational. A conventional flow sheet has depicted in its center a flow of materials starting from the raw materials and ending in the final products in the manufacturing process, but Professor Motoji Shimpō<sup>1)</sup> of Nagoya University has introduced the idea of a negative flow sheet which depicts centrally (the influencing objects) the environment. In short, it is the point of view that the process control should be considered, covering not only the flow of all the materials in the manufacturing process, but the discharging of the contaminants. The main point is that keeping the contaminant emissions at a minimum during production is the first necessity to control air pollution. This idea also exists in the pollutant release and transfer register (PRTR) which was introduced by Professor Kohei Urano of Yokohama National University. Generally, what should be considered is that the process with a larger amount of raw materials which are not put into products has a higher contaminant discharge factor, and more contaminants are discharged in a highly complicated process which incorporates multiple steps in the production process.

#### 7.1.3 Air Pollution Control Equipment

The adoption of the air pollution control equipment must be considered when it is impossible to regulate the quantity of pollutant emission to the level of air pollution emission standards even if the manufacturing process is thoroughly rationalized and the fuel and raw materials are chosen carefully based on the above idea, and when the emission of pollutants which are not regulated still could cause air pollution. Generally, it should be recognized that the air pollution control equipment such as dust collector, exhaust gas desulfurization equipment and heavy oil desulfurization equipment are all just pollutants collectors and sufficient care should be used in its employment. In other words, it is considered that the environmental pollution is induced when there are an accumulation of materials

and a polarization of many things. The collected pollutants would be dispersed by nature if left untreated, and cause environmental pollution. Therefore, changing the point of view, it should be recognized that the air pollution control equipment which is a material collection device is useful for a temporary lowering of environmental pollution, but does not exterminate the cause of environmental pollution if the contaminants it collects are dumped carelessly. Moreover, it should be considered that in the operation and management of air pollution control equipment some energy is necessary and this acquisition means is a factor in contaminant emissions.

In 1823, the alkaline industry in England which adopted the Leblanc soda process flourished, brought about damage from hydrogen chloride polluting the air. Then, taking this opportunity, the Alkali Act was established and regulation of hydrogen chloride was instituted. In 1863, this was solved by developing a control by processing the exhaust gas via washing in. It is believed to be the world's first chemical discharge control. But this was criticized as "only changing air pollution into water pollution" because it discharged the drainage into rivers<sup>3)4)</sup>. Thus, maintaining environmental safety, including a utilization method with air pollutants which were collected by an air pollution control equipment, is important and it seems that a consideration of the collected contaminant as resources is also essential. Moreover, when talking about the consideration of resources, a consideration of the material as resources which are used in the air pollution control is also important. For example, in the case of dry process exhaust gas denitrification equipment which reduces NO<sub>x</sub> in catalytic reaction with ammonia, the consideration should be agreed upon for the limitation of ammonia supply, and it is the same with the wet process exhaust gas desulfurizing equipment which uses ammonia as a neutralizer. Furthermore, it should be recognized that, when ammonium sulfur is added to fertilizer, it acidifies arable soil, and the problem of damage to environmental protection remains<sup>5)</sup>. Also, the sulfuric acid manufactured by the dry method exhaust gas desulfurization equipment promotes the use of ammonium sulfur in fertilizer.

In Japan, especially, sulfuric acid is in surplus. At this point, gypsum is imported due to a shortage and the limestone-gypsum process has a higher priority in the consideration of resources and environmental safety. Moreover, it is an excellent technique to collect air pollutants for reusing the flyash which was collected with an electrostatic dust collecting equipment as a raw material for cement, for reusing the fumes in the exhaust gas from converter which was collected with a bag filter as a raw material in iron manufacturing, or for reusing to a crude oil tank the evaporating gas which was collected through washing with kerosene in the gasoline forwarding facilities. In this way, to use an air pollution control equipment, it is necessary to sufficiently examine the benefit to environmental safety and the use of collected materials considering the restrictions on the resource and energy. Accompanying this is the necessity to consider the transportation means of by-product materials and the materials control needed for equipment operation<sup>6)</sup>.

#### 7.1.4 The establishment of an air pollution control organization

And, as for the technical activity, the establishment of an air pollution control organization centered on technical expertise is indispensable and much thought should be given as a software part of the control technology. This sometimes presses the change to the conventional view of manufacturing technique. There are examples of a thermal power plant which had to spare much of the site area for air pollution control equipment and of a coal firing

thermal power plant which had to construct exhaust gas desulfurizing equipment in the coal storage space which had been the hard core of a thermal power plant. Also, there is an electric power companies which among the many electronic engineers chemical engineering experts is appointed as director to smooth the management of the exhaust gas desulfurizing equipment. Thus, for effective management of air pollution control organization, it should be attested that air pollution control technology has been broadly influential, exceeding the conventional academic boundaries of the engineering field <sup>7)</sup>.