● High Temperature Coal Combustion Gas Dust Collecting Technology

(Evaluation Process Development of Dust Collecting Filter Capability)

1. Outline

Coal is ranked at an important energy source in Japan, because coal has abundant reserves in the world, and its supply has been stabilized with generally stable prices. However, in comparison with other fossil fuels, its emission amount of CO_2 is higher. Then, mitigation of its environmental burden is requested worldwide, based on the upheaval of the consciousness for the Global Warming issues.

Reduction of flue gas emissions by higher efficiency combustion could be one of the most realistic countermeasures to reduce the CO_2 emission. As for the high efficiency coal firing power generation systems, both Pressurized Fluidized Bed Combustion (PFBC) and Integrated Gasification Combined Cycle (IGCC) technologies have been under development, domestically and internationally. We can expect improvement of their thermal efficiency by raising their combustion temperature and pressure.

However, their required high temperature dust collecting technology has not been established, although it is indispensable for their commonly applying combined cycle power generation. Currently, they are coping with it by some other alternative technology or by mitigating their strict designing requirement. Regarding the dust collecting method to be used under higher temperature and pressure, there are such practical means as cyclone, ceramic filter and electric dust collector, etc., of which a dust collecting filtration device with a filter seems promising at present.

However, regarding the porous filtering materials, we have not established any evaluation technique or method on how to evaluate its strength and its de-dusting capability, etc. In other words, the purpose of this R / D is to establish an evaluation method on capabilities of the filters which are to be tested.

2. Schedule of Development

Regarding the selection of the filtering materials for high temperature dust collection and its application for demonstrating device, a practical test done by the demonstration could become a most reliable evaluation method. However, practically it is impossible for us to use such a filter, which is still under development, in particular, because of the scale and largeness of the actual filters.

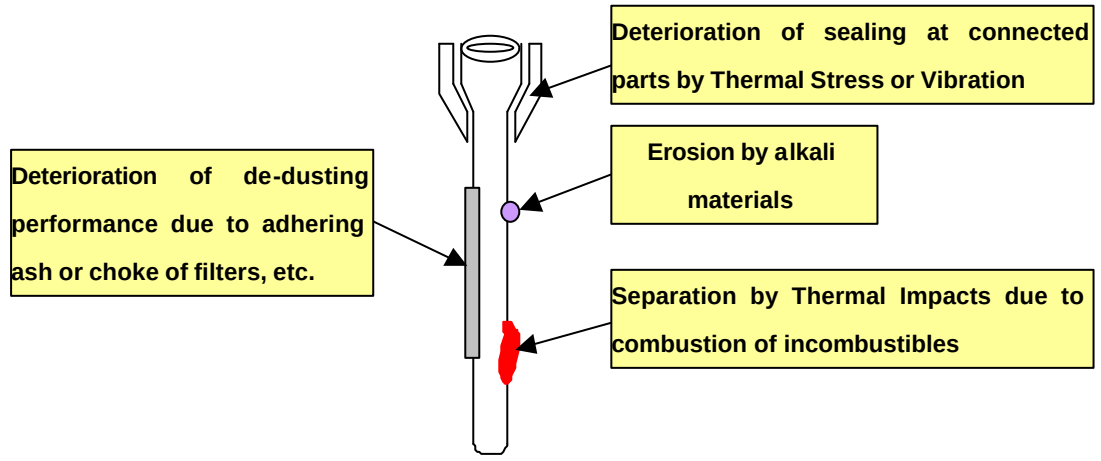
For this reason, it is targeted that **without testing by the demonstration device, by using a small testing equipment, an evaluation method should be developed to judge whether we should or should not use the demonstration device in running a test to feature the basic material of the filter, as well as, to run de-dusting and related corrosion tests, etc.**

	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001
Survey & Research	Study of Technical Trends & Tames／Gathering of Basic Data／Analysis of movement of dust in dust collector					
Tests on Physical Characteristics of the materials	Acquisition of Basic Physical Characteristics			Thermal Impact Tests		
Tests & Simulation at Laboratory		Exposition Tests using mock gas / Small scale de-dusting test		Thermal Stress Analysis		
Tests using actual coal gas			Tests to check De-dusting performance			
Manufacturing of Samples of the filters			Manufacturing of samples of the filters			

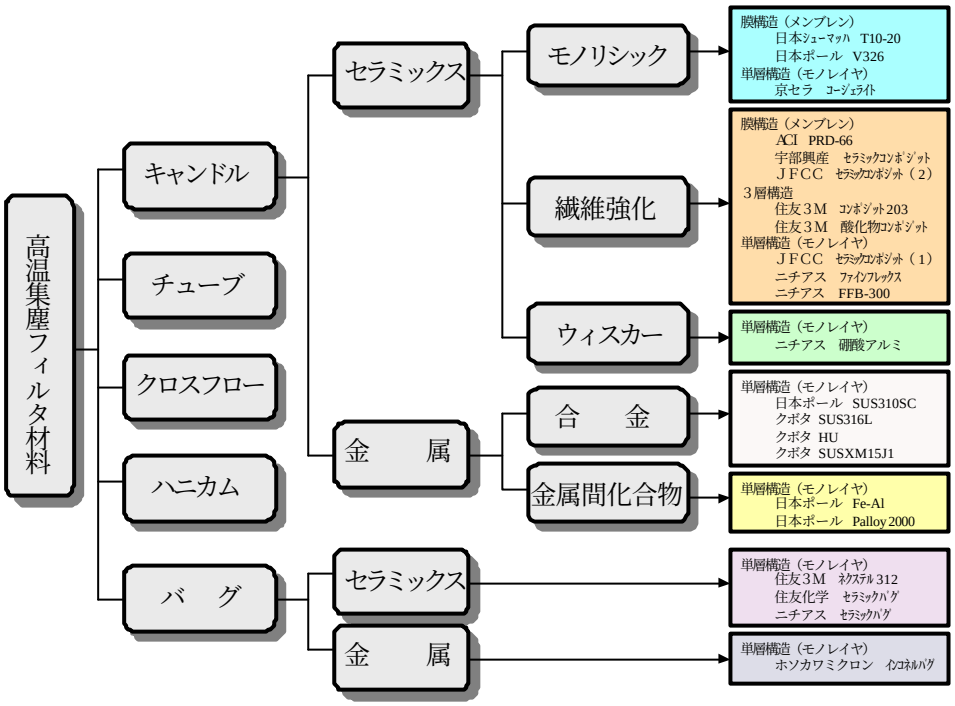
3. Problems on High Temperature Dust Collecting

The major issues related to the ash grains, which cause troubles under high temperature dust collection in a filter -using dust collection device, are as follows,

1) Troubles by the increase of adhering ash under high temperature
2) Troubles caused by both the ash carrying unburned carbon and some other corrosive ingredients.



4. Composition Chart of Filter Materials



5. Evaluation Method

Currently various data acquisition tests are undergoing, and by the following tests a related R&D is also under implementation to enable the expected evaluation.

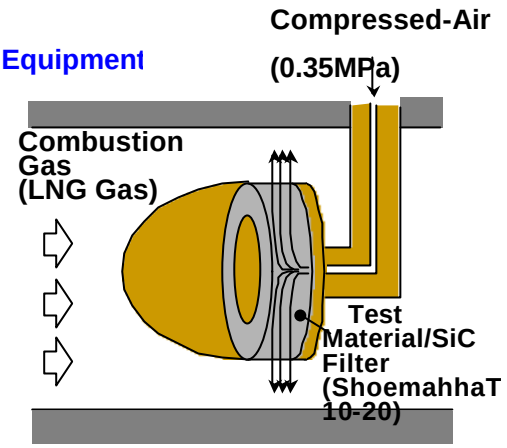
1) Material Featuring test

Regarding the featuring test, we can obtain beneficial information on the location and extent of damages of filter materials in statistically comparing the test results with the other testing results of the filter materials which come from the mock gas, small scale de-dusting and the demonstration gas, respectively, in evaluating by means of the same O ring pressing linking tests.

2) Thermal Impact Test

In order to provide a closer testing environment for the demonstration equipment, the cooling gas is forced to pass through a testing device to demonstrate a cleaning injection in a reverse flowing through the inner portion of the filter element. By this means, heating and cooling could be given to the tests to enable us prove the heat proof impact tests which was formally unavailable by means of a conventional electric furnace.

Testing Equipment



3) Mock gas exposition test

By using a mock gas, filter corrosion tests are done both under reducing and acidifying atmospheres.

4) Small scale de-dusting test

In order to survey both various operation conditions under reducing and acidifying atmospheres, as well as, de-dusting capability of the filter under pulse cleaning conditions and its cleaning behaviors, a small scale research evaluation testing equipment is planned to be fabricated to run a series of laboratory scale.

5) Actual coal gas deduction test

By choosing a filter element applicable for the projected high temperature de-dusting technology through basic material featuring tests and a small scale evaluation test, we intend to ascertain the de-dusting capability of the filter by an exposing test under the high temperature practical gas environment, filter material strength variations (by O ring pressure link test) and its influences for the ash cohesion on the filter. In addition, we would check both corrosion of the element and the factors how the ash coheres on it.

Outline of Process-flow of the Testing Facility of De-dusting Filters