Study on Magnetic Separation Applied to Remove Micro Particles in Boiler Feed Water.

°K. Imamura[1], H. Okada[2], T. Ando[1], N. Hirota[2], S. Nishijima[3] (1. Nihon Univ., 2. NIMS, 3. Osaka Univ.)
E-mail: cike13011@g.nihon-u.ac.jp

In Japan, after the Great East Japan Earthquake, demand of thermal power generation discharging a lot of carbon dioxide is increasing. We are developing a method to improve the generating efficiency of thermal power plants, and significantly reduce carbon dioxide emissions.

Corrosion product (scale) including Fe_3O_4, which is formed from dissolved iron in boiler feed water, reduce heat conversion efficiency of boilers and cause pressure loss of systems. We are developing a magnetic separation system to remove scale. This system captures scale by magnetic force of the magnetized wires.

Numerical simulation is efficient and effective in our study, because it is difficult to carry out frequent experiments in thermal power plants. We use COMPACT [1] of a commercial Computer Fluid Dynamics program to calculate these simulations. In this study, calculation model is a two dimensional plane model in which the layout of wire of mesh-net is placed.

The layout shown in Fig. 1 was examined. Mesh-nets of this layout becomes finer in order from the inflow side. A characteristic of this layout is each wire without overlapping in view of flow direction. As a result of examining the capture performance for this layout, it was found that capture ratio of rear side wires is increased and capture volume of each filter is to be approximately same amount. In the case of such a layout, concentration distributions are shown in Fig. 2, and it is found that the concentration distribution depends on the distance between rear wires. In these results, the temperature of water is 200℃, Reynolds number is Re=1900 and a characteristic length was defined wire diameter d. In Fig. 2 (A) that the distance between rear wires is narrow, concentration distribution passing through the front wire was a rapid change. On the other hand, in Fig. 2 (B) that distance is wide, it was a slow change. From these results, it was found that effective capture of scale can be realized by control of placing wires

This work is partially supported by Advanced Low Carbon Technology Research and Development Program (ALCA) of JST Strategic Basic Research Programs.

[1] S. V. Patankar, Numerical Heat Transfer and Fluid Flow, Taylor and Francis, 1980

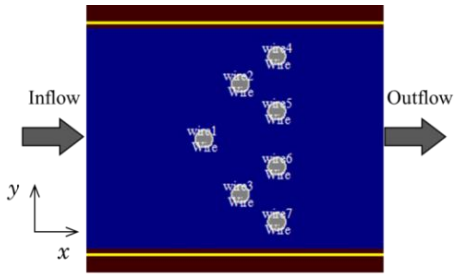
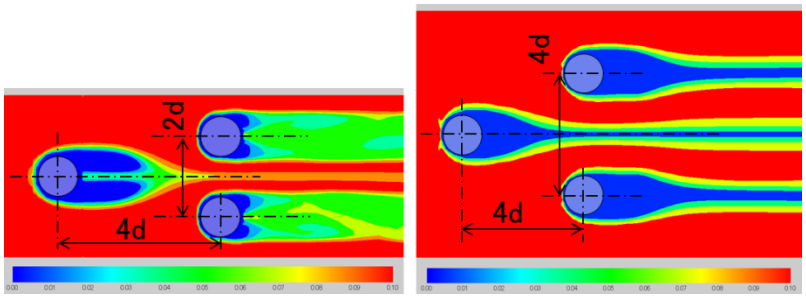


Fig. 1 Layout of wires without overlapping in view of the surface of inflow direction.



(A) (B)

Fig. 2 The difference of concentration distribution by the distance between rear wire; (A) the distance between rear wires is 2d, (B) that is 4d.