NADCA/BNF Water Model Benchmark Case

Taken from an extensive validation exercise, figures 1a and 1b show instants in time during the filling of a water model of a diecasting, an example from the well-known NADCA/BNF water model studies. The solid model of the casting, tapered runner, three gates and overflows is shown in figure 3. The main features of the flow in figures 1a and 1b are

i) The initial angle of entry of the liquid jets and
ii) Their subsequent rebounding flow back towards the gate positions.

Figures 2a and 2b show velocity vector maps from MAVIS-FLOW for comparison. The gate velocity was 30m/s. The model recreates the main features of the flow. (Other validation studies of the MAVIS system were presented in the December 1999 issue of Diecasting world.). Initially, the three gates lead to three jets of liquid entering the cavity. At first, they travel across the cavity independently. On contact with the die walls the three flows rebound into each other and eventually the liquid movement continues in the opposite direction, back towards the gates. Figure 5 shows the fluid front progression in 3D. This example concerns a relatively simple cavity geometry, however, real components are often much more complicated. As an example of a more realistic component, figure 4 shows the filling of an aluminium pressure diecasting. Clearly, from pictures such as this the effectiveness of the overflows will be revealed, although the simulation produces many other useful data.

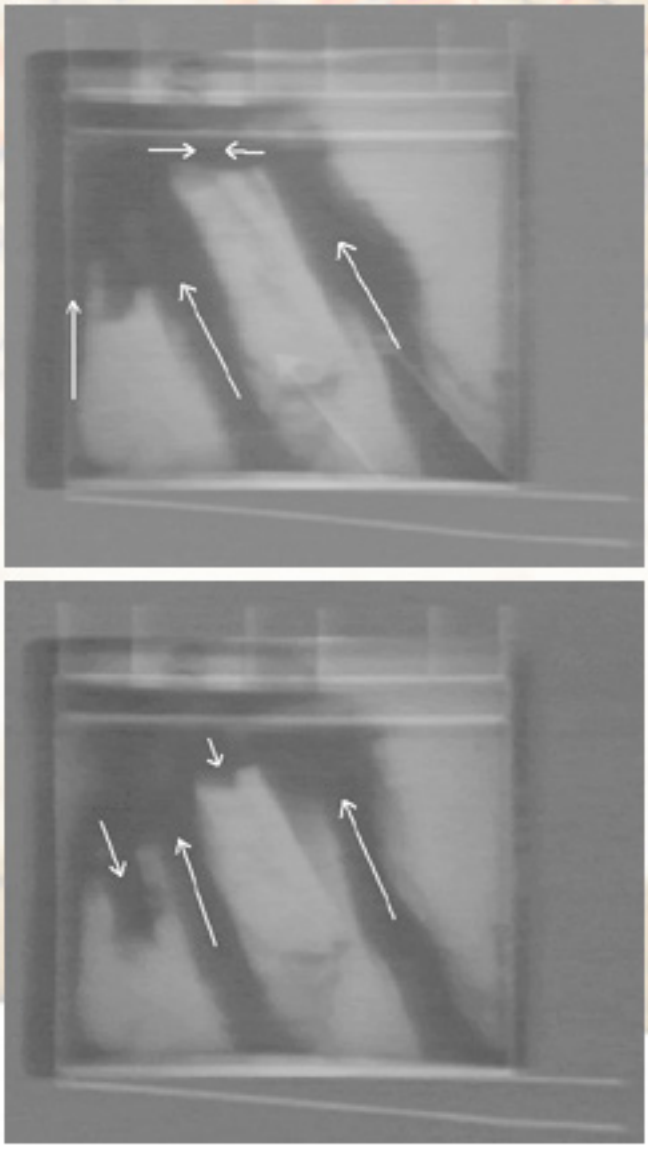


Figure 1 a and b. Video capture screens of water model experiment of die filling, gate velocity 30m/s.

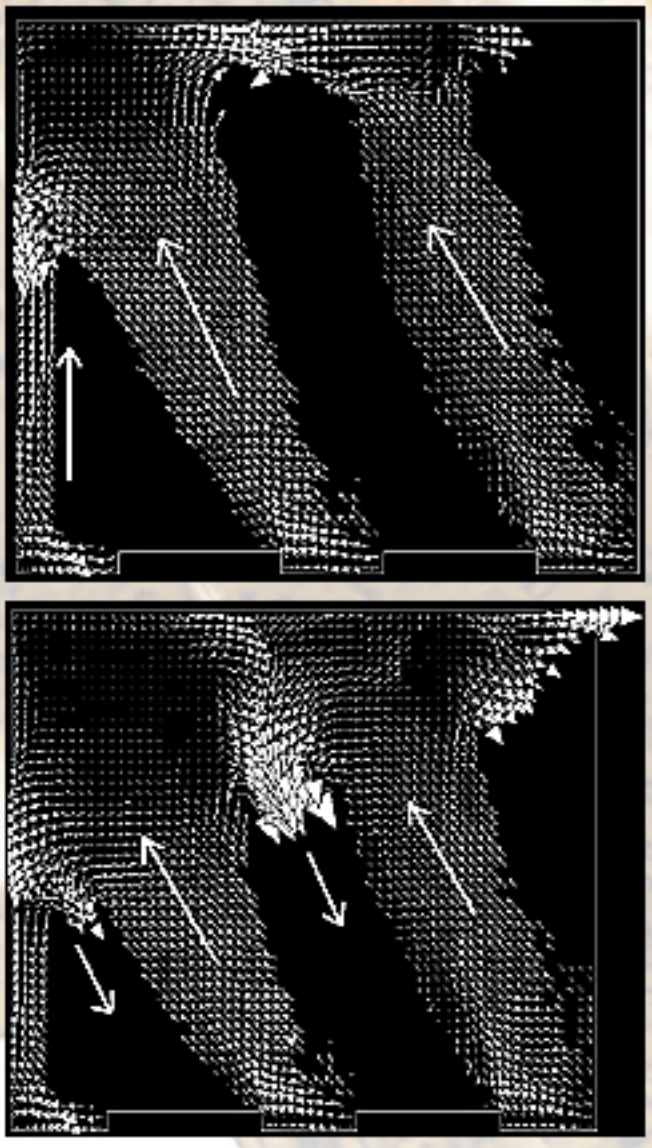
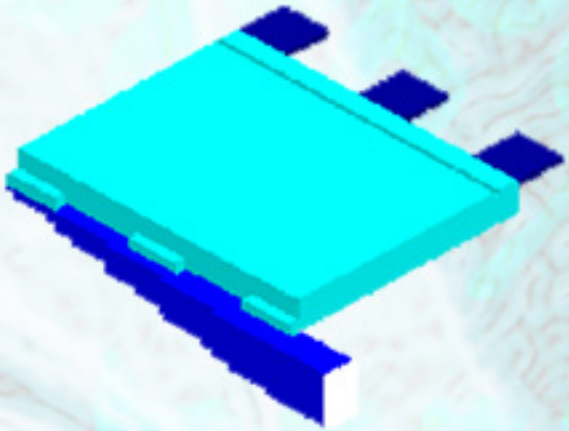


Figure 3 a and b. Velocity vector plot of a 2D section through the 3D simulation during filling.



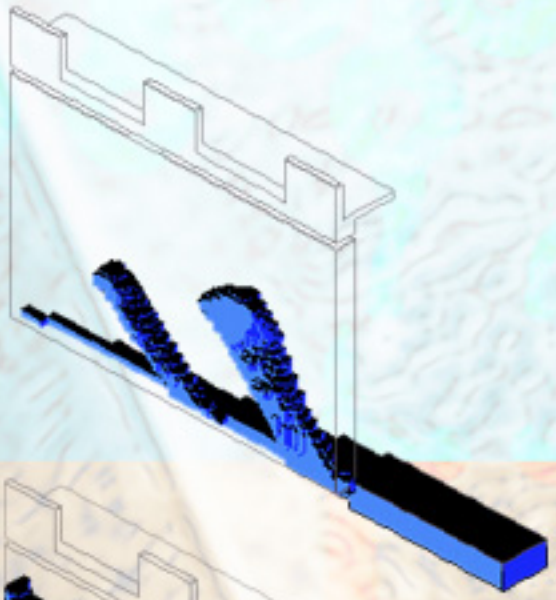
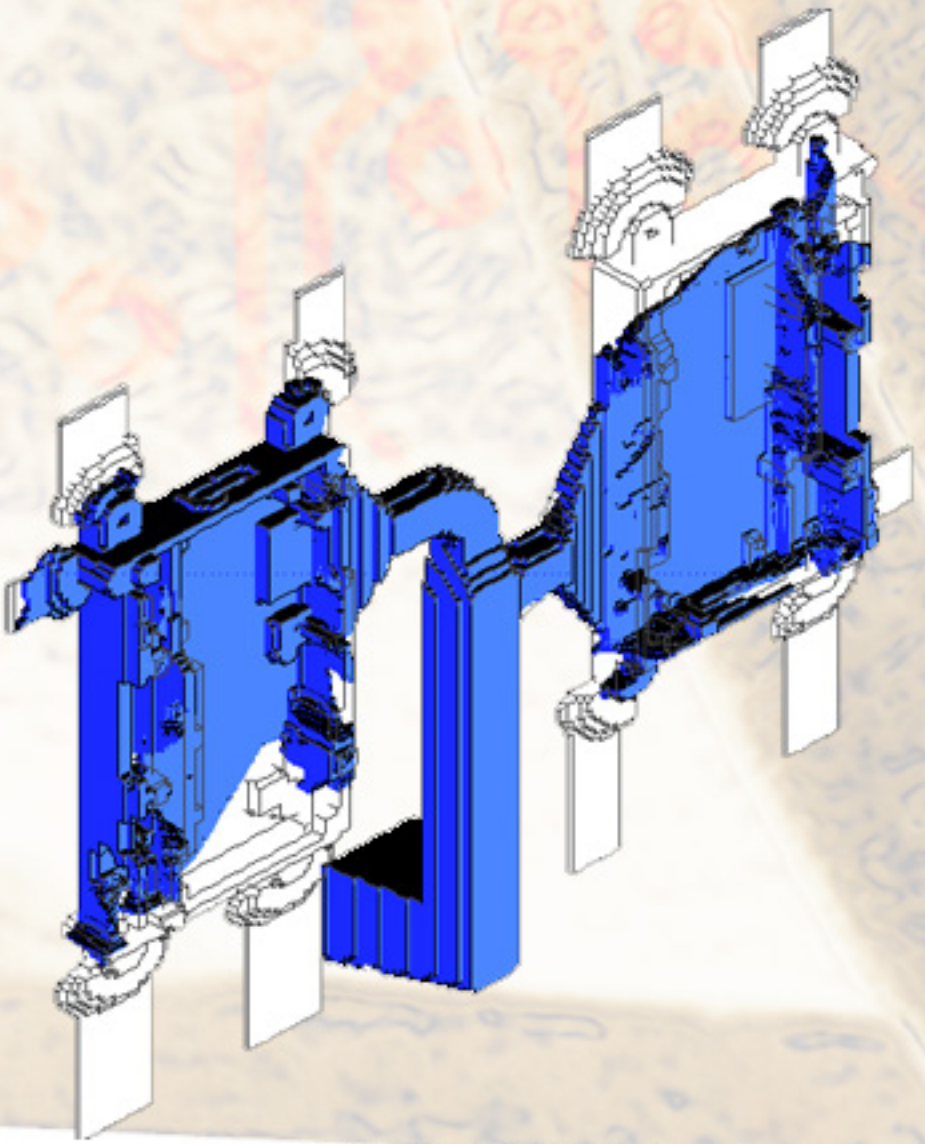


Figure 3. MAVIS solid model file of casting, tapered runner, gates and overflows.



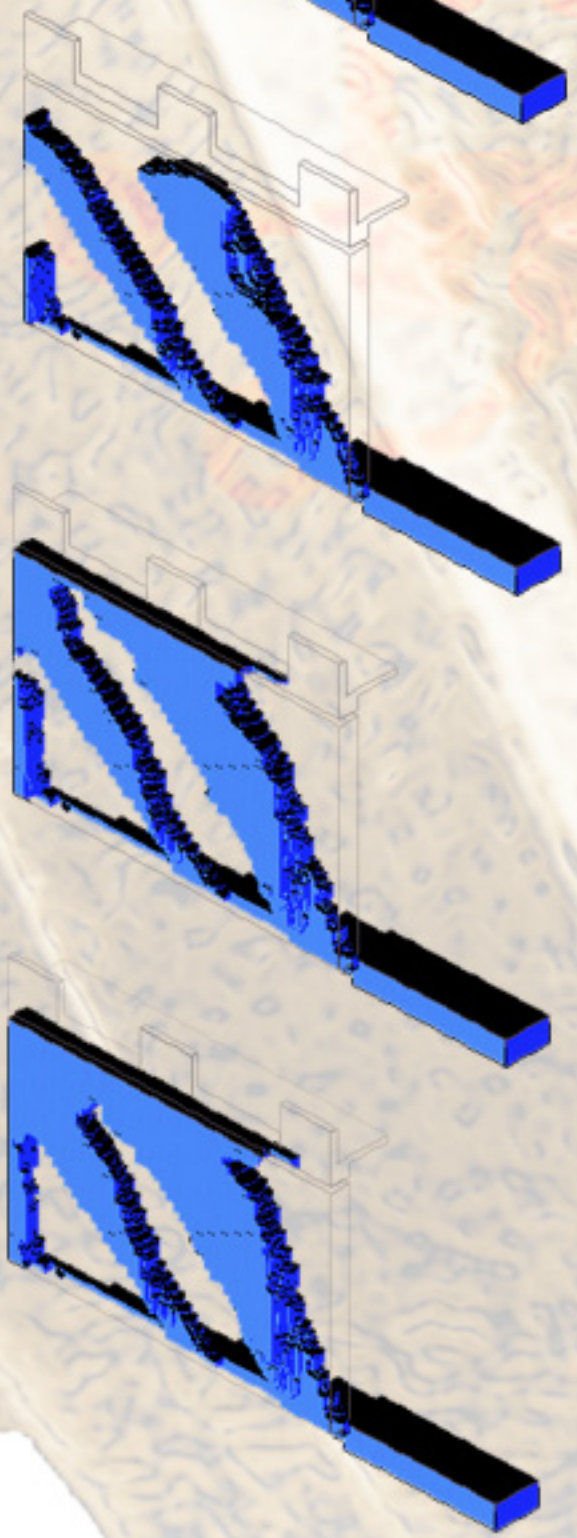


Figure 4. MAVIS-FLOW simulation of an aluminium alloy pressure diecasting.

Fig 5. 3D plots of fluid front progression