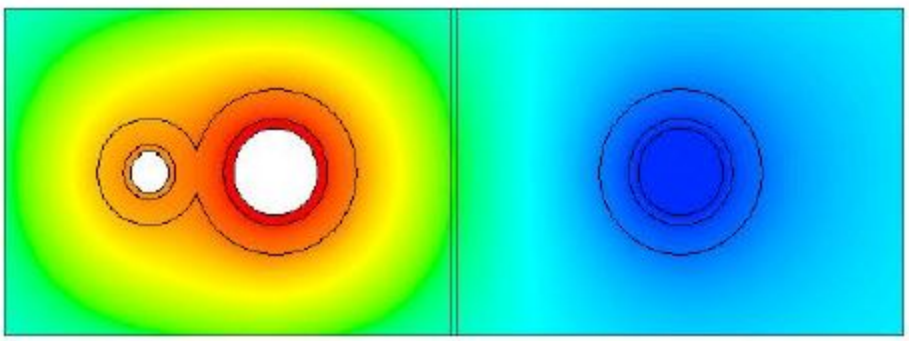
- Report–

17.05.2016



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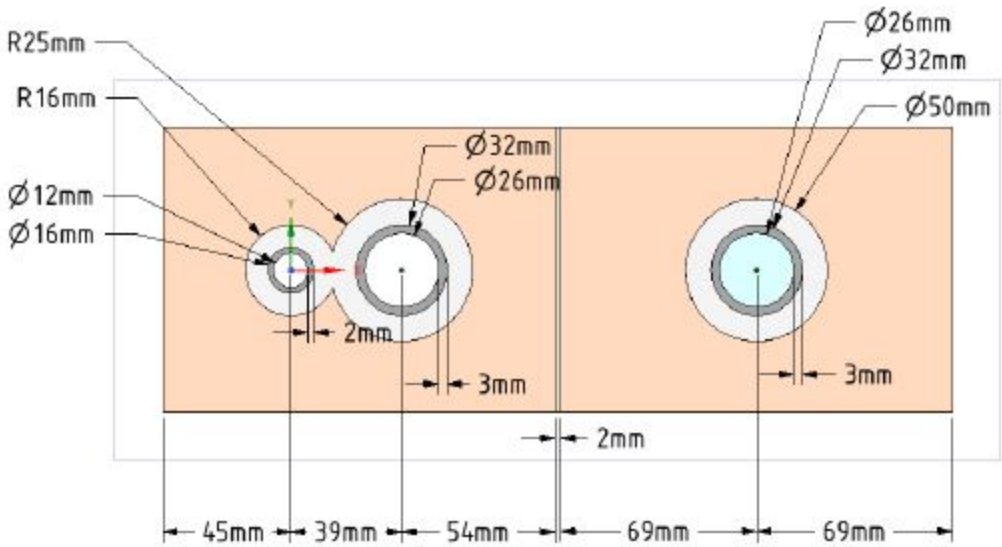
ANALYSIS OBJECTS

The objective of the analysis is to determine the time required for the water in the cold pipe to heat up from 6 °C to 24 °C, when the cold water is not running. Approximately 0.05 l/s flow circulation is maintained in hot pipes to maintain 60 °C at the beginning of the hot water pipe and 55 °C at the end of small circulation pipe.



ANALYSIS RESULTS

The transient simulation was run for 31.5 hours of simulation time. Figure 4 shows the graphs of temperature (°C) versus Time (hour) for four locations: cold water, inner wall of the cold pipe, outer wall of the cold pipe and inner wall of PUR. With fluent simulation it took 27.5 hours for the cold fluid to reach the temperature of 24 °C. The temperature can be estimated to stabilize around 25 °C as the simulation progresses. The heating of the cold fluid per degree is also reported in Table 2.

The temperature distribution at the beginning of the simulation and at the time when cold fluid reaches the temperature of 24 °C is shown in Figure 5.

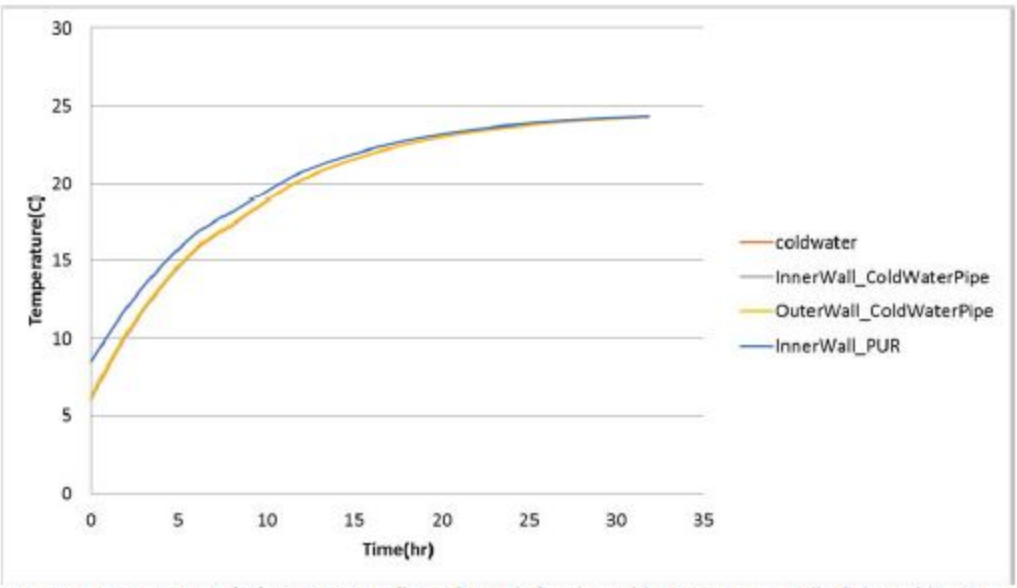


Figure 4 Temperature (°C) versus Time (hours) graph for the cold water, inner wall of the cold water pipe, outer wall of the cold water pipe and the inner wall of the insulation.

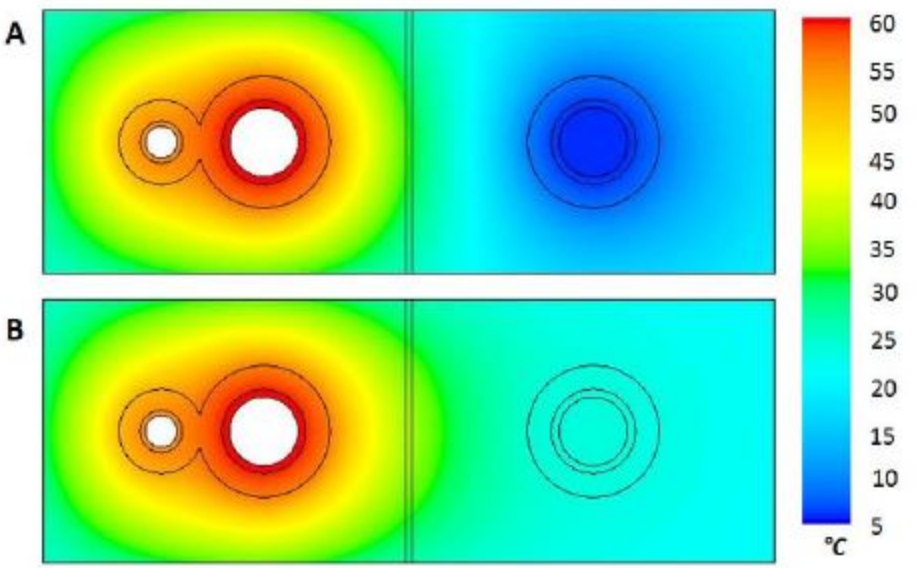


Figure 5 Temperature (°C) distribution at (A) the beginning of the simulation (time t=0) and at (B) time t=27.5 hours.

Table 2 Average temperature (°C) of Cold water recorded at various time instances (hr).

Average temperature of cold water [°C]	Time passed from closing the tap [hr]
6	0.0
7	0.4
8	0.9
9	1.4
10	1.9
11	2.5
12	3.1
13	3.8
14	4.6
15	5.4
16	6.2
17	7.6
18	8.7
19	10.0
20	11.5
21	13.6
22	16.2
23	20.1
24	27.6

CONCLUSIONS

The conjugate heat transfer is solved within an insulation block to determine the time required for the stagnant cold water to reach a temperature of 24 °C from an initial temperature of 6 °C. The temperature distribution for the initial condition i.e. the time before the tap is turned off is obtained with a steady-state simulation (see *Figure 5*-A). With the numerical simulations it took about 27.5 hours for the cold water temperature to reach 24 °C.