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Research Paper

ENERGY RADIATED IN STEEL PLANT BY ATTACHED FURNACE AND CASTING MEDIA BY PIPE ARRANGEMENT

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Heat energy loss is the very critical issue in the world and second heavy quantity of heat energy is to be loss in steel industry. In steel plant more quantity of energy is required but still the loss of energy is going on. We tried to reduce the loss by applying the suitable technique. In the every steel plant open system is used. Suppose move towords countinuous casting process there is an open casting process goes on. If apply close packing system, and inside this make a casting work, we will get the energy save. Transportation of ingots from one shop to another shop in this case heat loss at very high percentage and ingots has to be cold down.When has the rolled purpose; again we have to keep these raw material inference and rolled. In this way the loss of energy go on and this can be controlled by making all opration in single unit. In steel plant lots of sections are spread in different places, there is no coordination among each other.

Keywords: Steel plant, Furnace, Heat Energy, Pipe

INTRODUCTION

Saving of energy radiated in steel plant, furnace of steel industry directly attached to casting die. A Heat Energy Mechanisms and Solidification process are simulated for a continuous casting machine and the constructive shape of the liquid pool is predicted considering at different conditions. This model involves 3-dimentional transient energy equation. The governing equation was solved using control volume method and ansys simulation process. The boundary condition of the mold, water spray cooling and air cooling region have been defined. The mathematical model it is able to invent the shell thickness, temperature distribution in the mold and shell, interfacial gap between

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Table 1: Input Data for Experimental Condition

Steel Conductivity, K_{steel}	**$f_1 \times k_{liquid} + (1 - f_1) \times k_{solid}$**	**w/m^0K**
Carbon equivalent content,	0.132	pct
Steel density, °	7500	kg/m^3
Steel emissivity, ϵ	0.8	
Mold copper plate thickness	0.043 x 0.030	m x m
Total mold name	0.704	m
Mold copper plates width	2.220 x 0.215	m x m
Mod conductivity, k_{mold}	39	w/m^0K
Mold powder conductivity, k_{slag}	1.27	w/m^0K
Air conductivity, k_{air}	0.083	w/m^0K
Mold powder density, $°_{slag}$	0.653	kg/m^3
Mold powder consumption, rate, m_{slag}	0.8	Kg/ton steel
Casting speed, Vc	0.0167	m/sec
Pour temperature, T_{in}	1546	°C
Liquius Temperature, T_{liquid}	1528.6	°C
Solidius Temperature, T_{sol}	1494	°C
Slab geometry, W x N	M1	m x m
	M2	m x m
	M3	m x m
	M4	m x m
	Bloom 1	l x b x m
	Bloom 2	l x b x m
	Billet 1	l x b x m
	Billet 2	l x b x m
	Wire 1	d
	Wire 2	D
	Ingot	l x b x m
Scale conductivity on the surface of the slab, K_{sc}	0.5	w/m^0K
Scale conductivity of the surface of the mold, K_{scale}	1.0	w/m^0K
Scale thickness of the surface of the mold	0.00001	m
Average cooling water temperature in mold	28	°C
Water flow rate entering the mold small plate	0.0061	m^3/Sec
Water flow rater entering the mold large plate	0.0553	m^3/Sec
Latent heat of the steel phase change, L_f	272140	J/kg
Water conductivity, K_{water}	0.615	w/m^0K
Solid steel conductivity, K_{solid}	33.0	w/m^0K

Table 1 (Cont.)

Steel Conductivity, K_{steel}	**f_1 x k_{liquid} + (1 – f_1) x k_{solid}**	**w/m^{0}K**
Effective molten steel conductivity, K_{liquid}	7 x 43.0	w/m^{0}K
Scale thickness on the surface of the slab, ∂_{sc}	0.001	m
Steel specific heat capacity, C_P	C_p = 456 + 0.376 x T(°C) T<500	J/kg^{0}K
	C_p = 268 + 0.836 x T(°C) 500<T<700	
	C_p = 1431 700<T<750	
	C_p = 3849 – 3.766 x T(°C) 750<T<850	
	C_p = 648 850< = T<1100	
	C_p = 268 + 0.334 x T(°C) 1100< = T<T_{sol}	
	C_p = 772 T_{sol}< = T<T_{liquid}	
	C_p = 787 T> = T_{liquid}	
Steel conductivity, K_{steel}		

shell and mold. The modeling results were verified by the measurement slab, billet, bloom, wire, ingot, surface temperature and a reasonable agreement was succeed. The heat exchanger arrangement provide in steel plant. The molten solution flow through the pipe and over arrangement air heat exchanger for saving the heat energy.

RESULTS

Errors in heat loss in C.C. Process (Steel Melting Shop-2) and (Steel Melting Shop-1) also in maintenance equipment.

Solution

Input heat energy required for solidification purpose, but at the same time loss of radiated

Figure 1: Ansys Results

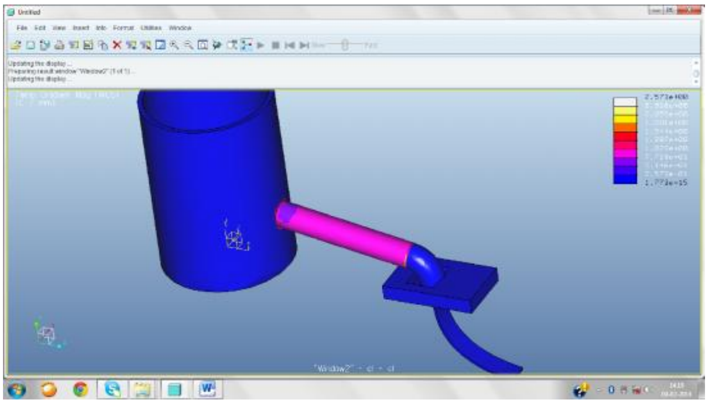
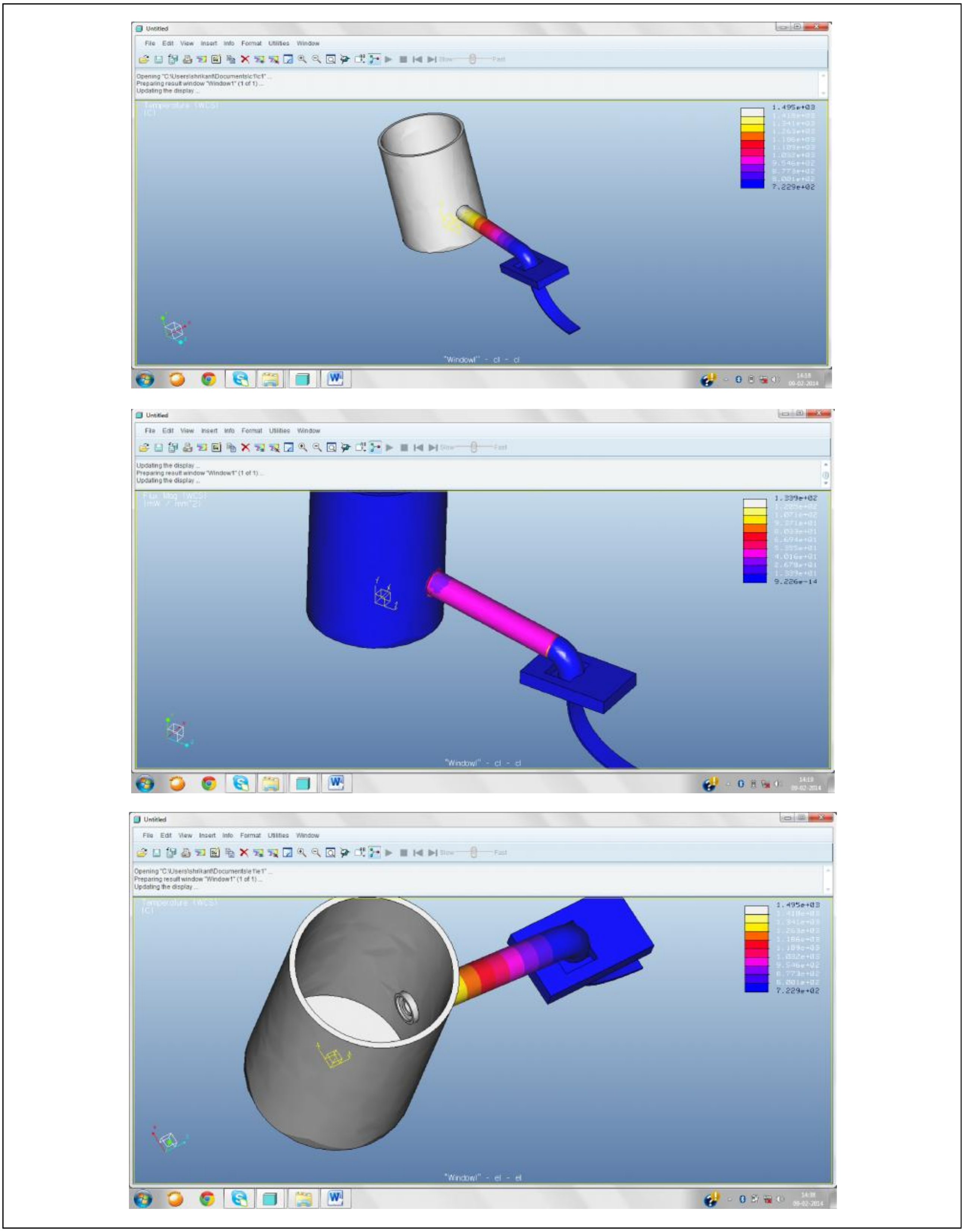


Figure 1 (Cont.)



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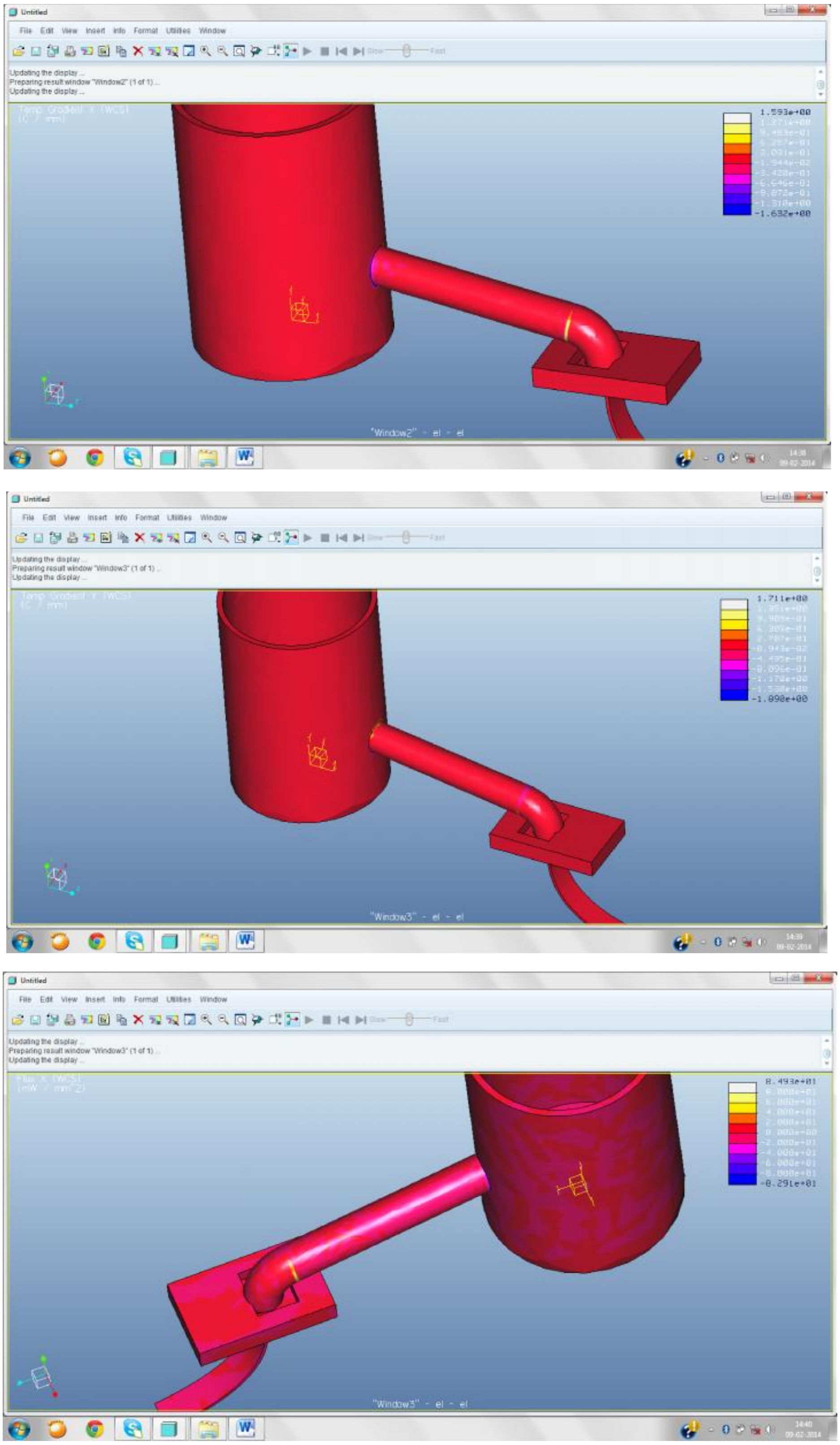

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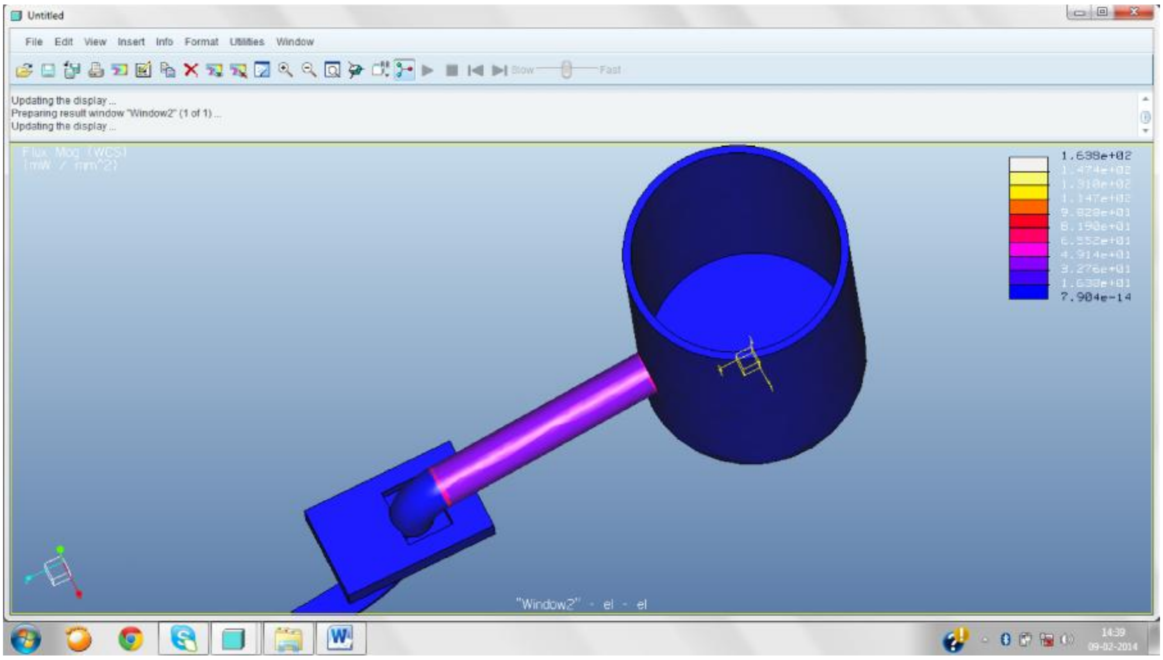

heat energy collects and reutilized to run small steam power plant.

Therefore for calculation purpose need only dry coal. For April 2002 month dry coal consumption m_f = 280316 x 10^3/30 days = 389327.78 kg/h

Therefore input heat energy supplied

$Q = m_f \times CV$

Q = 389327.78 kg/h x 30400 kj/kg

Q(i/p) = 3287656.8 kj/sec or kw

Output in the month of April 2002

Table 2: Heat Loss Calculation

$Q_{conduction}$	$Q_{radiation}$	$Q_{convection}$
Sheet 1 to 5	Sheet 1 to 5	Sheet 1 to 5
Total = 19819	Total = 81457	Total = 861022.92 x G (Effect to Thermal conductivity)

Adding output = $Q_{conduction} + Q_{radiation} + Q_{convection}$

$QTotal_{(o/p)}$ = 3114856.2

Efficiency of Steel Plant = Output/input
= 0.9474 (or) 94.7439%

%age error = (Input – Output) x 100/Output
= 5.5476262%

CONCLUSION

In Energy Loss

- Smaller plant layout.
- Manpower reduction.
- Indirectly operating cost will reduced.
- Building cost will reduce.
- Indirectly help to government finance ministry.

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