

**W1.71**

**Temperatures and various reactions  
inside and outside kiln from raw meal to clinker**

Sr No	Temperature range o c	Reactions
1	100 - 110	Vaporisation of moisture in raw meal
2	450 - 800	Combined water in clay released Bonding between SiO <sub>2</sub> and Alumina is lost $Al_2O_3.2SiO_2.2H_2O = Al_2O_3.2SiO_2 + 2H_2O - 213 \text{ kcal/kg}$ endothermic reaction
3	710 - 730	MgCO <sub>3</sub> is decomposed CO <sub>2</sub> is released $MgCO_3 = MgO + CO_2 - 275 \text{ kcal/kg}$ endothermic reaction
4	< 800	CaO.Al <sub>2</sub> O <sub>3</sub> is formed
5	750 - 900	CaCO <sub>3</sub> is decomposed CO <sub>2</sub> is released $CaCO_3 = CaO + CO_2 - 420 \text{ kcal/kg}$ endothermic reaction
6	800 - 900	CaO.SiO <sub>2</sub> is formed
7	900 - 950	5CaO.3Al <sub>2</sub> O <sub>3</sub> is formed
8	950 - 1200	2CaO.SiO <sub>2</sub> and 2CaO.Fe <sub>2</sub> O <sub>3</sub> are formed
9	1200 - 1300	3CaO.Al <sub>2</sub> O <sub>3</sub> and 4CaO.Al <sub>2</sub> O <sub>3</sub> .Fe <sub>2</sub> O <sub>3</sub> are formed
10	1250 - 1280	First fused product is formed
11	1260 - 1450	3CaO.SiO <sub>2</sub> is formed

reactions in sintering zone are exothermic

12 Theoretical Heat required to produce 1 kg clinker

$$H = 4.11*Al_2O_3 + 6.48*MgO + 7.646*CaO - 5.116*SiO_2 - 0.59*FE_2O_3 \text{ kcal/kg clinker}$$

Al<sub>2</sub>O<sub>3</sub> etc are oxides in % in clinker on loss free basis