Cooling slope casting (CSC) is the simplest and cheapest method that is used to produce non-dendritic feedstocks for thixoforming technology. In the present investigation, the effect of pouring temperature and the type of the mould and cooling slope plate on the formation of fine and globular microstructure of A356 Aluminum alloy was studied. Molten A356 alloy with temperatures of 630 °C, 650 °C and 670 °C was poured on the surface of inclined plates then casted in the mould. The inclined plates and moulds are made from different materials, typically, low carbon steel, 304 stainless steel and pure copper. The analysis of variance (ANOVA) statistical technique was carried out to specify the most significance parameter that affect the microstructure of the produced feedstocks. Taguchi’s method is used to specify the optimal CSC processing conditions. The results indicated that the material of the mould/slope plate combination has highest statistical and physical significance when compared with the pouring temperature on both the grain size and shape factor of the α-Al primary grains. The A356 feedstock poured at a pouring temperature of 650 oC on a pure copper cooling slope plate and casted in a pure copper mould exhibited the best microstructural characteristics suitable for thixoforming.