- The process is operated batchwise.
- Large amount of by-products need to be handled or recycled.

More recent developed processes have attempted to overcome some of these disadvantages.

5.4.2 The Union Carbide Process

Research on this process was initiated in 1976 after the international oil crisis. The US Government funded several projects with the objective of finding a route to inexpensive solar grade polysilicon. The Union Carbide process for silane production, with fluidised bed production of polysilicon, was selected for further funding. When the funding was not provided for political reasons, Union Carbide decided to use the silane technology for the production of semiconductor grade polysilicon. Silane deposition technology for polysilicon rods was licensed from Komatsu Electronic Metals, Japan. In 1990, the business was sold to Komatsu, which became Advanced Silicon Materials (ASiMI). By 1998, two large industrial plants were constructed in the United States with the nominal capacity of 5500 MT polysilicon, thus ranking ASiMI as number two or three worldwide among the polysilicon producers. A schematic overview of the process is given in Figure 5.4.

The main process steps are as follows:

The hydrogenation of tetrachlorosilane through a mass bed of silicon metal is carried out in a fluidised bed reactor as already described by equation (5.33).

The trichlorosilane is separated by distillation while the unreacted tetrachlorosilane is recycled back to the hydrogenation reactor.

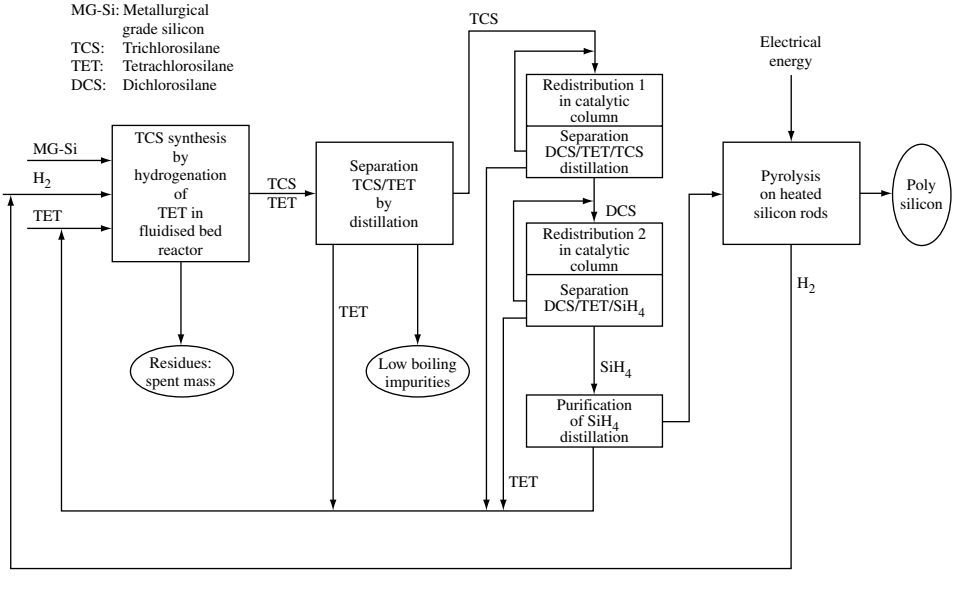

Figure 5.4 A schematic representation of the Union Carbide Polysilicon process