**dc Machine Efficiency**

The Machine has been designed as a multipurpose teaching machine.

Firstly, its efficiency is intrinsically low due to its ‘Extra-Low-Voltage’(ELV) operation

i.e. Pcu = VI = I2R

Hence, where possible industry (to reduce the magnitude of the current drawn by their machines) run their machines at as high a voltage as possible e.g. 11kv plus (HV)

By way of advantage, this low efficiency ensures student experimental meter readings, when used in their laboratory calculations, do not exceed 100% efficient

Secondly, to enable the machine to be connected to operate in at least nine(9) different modes required compromise in design this came at the cost of further sacrifice of efficiency

The versatility of the machine, however, is only limited by the teacher’s knowledge and industrial experience

One of the key design criteria was, the machine had to self excited as a Shunt Generator.

To achieve this, the critical resistance of the shunt field is relatively low

Thus the overall efficiency of the machine depending on connection is under 50% or less, due to the high copper loss (I2R) in the shunt field.

The copper losses are further compounder by the ELV

By connecting the two shunt field coils in parallel rather than in series the losses will be further increased. This will produce a stronger field resulting in reduces speed.

Also, being a doublely feed dc machine, subject to slight changes in resistance, differences in performance can be demonstrated as the machine is run up to temperature

(i.e. temp. coefficient of resistance)