5.1) **Comments:-**

5.1.1) **CANBUS:-**

As mentioned in the first chapter, the main objective was to implement monitoring and control system for a DC-motor unit using the CANBUS protocol, where the monitoring and control device is a PC. At the end this objective was not achieved and the system was modified and functioned properly.

Throw out this project, the CANBUS networks proved the claimed properties of reliability and flexibility. The helpful characteristics of the CANBUS protocol that was proved can be stated as follows:

- Design modifications can be ease done without changing the network topology.
- System improvements {like adding new nodes} were easily done without any mentioned changes in the physical layer.
- Error checking mechanisms used by CAN networks were very useful in detecting errors and investigate their cause.
- Low cost of CAN microcontrollers, CAN transceivers and CAN bus connectors.
- Using microcontrollers in the design of the CAN system provides the ability of reshaping the whole control system without the need of new components.
5.1.2) **Servo-controller:-**

As was mentioned in the previous chapter, the servo-controller is the only part of the system that did not function properly. Because the servo-controller is provided as closed box with Keypad display and CAN connector, it cannot be tested to determine the exact source of error. Although many different configurations have been tested, none of them resulted in successful CAN communication of the controller. The reasons behind the improper performance of the servo-controller are believed to be:

- There may be some connections required before CAN bus communication can take place. But the internal hardware structure of the controller is not accessible.
- The documentation of the servo-controller mentions some hardware that is overridden by the training system manufacturers.

5.2) **Suggested Future improvements:-**

5.2.1) **Adding new nodes to the network:-**

The system can be expanded by adding new nodes to the CAN bus. The new node may be another machine with integrated controller. In this manner, all the machines and PLCs in the lab can be joined to one CAN network. The user interface can be simply expanded to offer monitoring to the increasing number of machine. From the hardware point of view, any node can join the network by simply plugging its CAN transceiver into the bus. The other nodes are not affected by the result.
5.2.2) **Enhancement of the design:**

The design presented in chapter 3 was modified in chapter 4. The new design can be enhanced to perform very closely to the original system. The enhancements mainly consist of adding hardware that makes the new microcontroller performs the tasks of the omitted servo-controller. The microcontroller is a low cost and powerful alternative to the servo-controller:

- To achieve monitoring objectives can be met by adding sensors between the microcontroller and the machine. For example, a tachometer is used to measure the speed, other sensors to measure the field and current. The A/D module of the microcontroller converts the measurements to digital data and send it over CAN bus.

- To achieve control objectives, compensators must be designed and added to the microcontroller’s circuitry. In fact, many industrial controllers today have microcontrollers core. The figure in the next page illustrates the suggested enhancements.
Figure 5.1: Suggestion to enhance the system on the future