Machinery alone does not ensure efficient production in any industrial plant. It is essential that the workers operating these machines should be technically trained and efficient. Schmidt, Hunter, McKenzie and Muldrow (1979) have concluded that the impact of valid selection procedures on work force productivity is considerably greater than most personnel psychologists have believed. The National Institute of Industrial Psychology in London reports that the output on most jobs can be improved 20% to 30% by appropriate methods. Laird and Laird (1967) report, "efficiency does not depend on a special method or two or on some new machine. It is determined by the total situation. Machines, methods, people, attitudes - all are interrelated in setting the level of productivity.

Efficiency plays a very vital role in industry. Blum and Naylor (1968) have given different performance measures and different evaluative situations in industrial settings in the following table:
The Education Commission (1966), Rao and Arunajatai (1971) have pointed out that the students are admitted to vocational course (technician education) unsystematically and unscientifically
Keeping this in view, it would help to eradicate a great deal of wastage in industry if the personnel are selected systematically and tests for aptitude, personality and motives are administered prior to their selection.

AIMS

Efficiency is a psychophysical state. It is an outcome of psychological and environmental conditions; these determinants are responsible for keeping efficiency high and low. Environmental factors in relation to efficiency have undergone sufficient experimentation. Some of the psychological factors and efficiency have been studied by a few investigators and have been reviewed at some length in Chapter II. Though some work has emerged on personality, aptitudes and motives in relation to occupational success there seems to be a need for such a study in industry due to paucity of empirical research.

Each of the above mentioned factors, namely, aptitude motives and personality play an important role in work efficiency. The general intelligence is important for the worker not only at the placement level but also for subsequent performance. Special aptitudes are significantly important in industry - they aid the worker to channelise his interest and work more efficiently for the job which suits his potential. Adjustment to the job and the temperament requirement for
specific jobs can be determined by individuals personality patterns. The propensity underlying all these factors is motivation. Motives propel the individual to action.

The study undertaken currently is aimed at investigating whether or not the personnel in technical institution and the skilled/semi-skilled workers of industry are suited to their respective jobs in respect to aptitude, temperament and motives. In order to accelerate productivity and maintain it, and to stimulate people to their maximum efficiency it would help to know before hand about their basic abilities and potentialities, their temperamental suitability and their basic motives. Further, organizations can provide their workers with task relevant feedback so that each worker can know the direction of his work. This would help the industrial plants to eliminate wastage of manpower and enhance work efficiency.
HYPOTHESES

Review of literature enables one to draw certain legitimate conclusions and expectations in further research. In the present study an industrial bias exists and work efficiency is studied from the angle of its multiple correlates. For the three variables namely, aptitudes, personality and motives the deduction of hypothesis in relation to work efficiency will be presented one by one with reference only to the more salient work in the respective areas.

Intelligence and efficiency

Dunnette (1973) has aptly said that abilities are primary determinants of job performance. An adequate level of general ability is essential for effective performance. Proctor (1937) found the mean intelligence score to be 99 for skilled profession. DeCecco (1970) found a correlation of .42 to .87 between intelligence and scores on academic achievement. Vernon (1958), Brown (1970), Mohan (1976) and Randhawa (1977) found a positive relationship between intelligence and academic achievement. According to Super and Crites (1962) "Given intelligence above the minimum required for learning the occupation increments of intelligence appear to have no special effect on an individual's success in that occupation".

The validity criteria of intelligence as measured by GATB were taken objectively when production records were
available and appeared to reflect ability of the worker rather than the extraneous factors (Super and Crites, 1962).

Proctor (1937) found that intelligence quotient in different types of work varied and the mean score for skilled and semiskilled was 99 and 97 respectively. Vohra (1977) found a positive correlation between intelligence and academic achievements of the polytechnics.

"In view of reported literature, it can be expected that intelligence and the academic achievements (Practical and Theory) of the ISTC students would correlate positively. In industry too, a positive relationship between intelligence and work efficiency may be expected."

Aptitudes and Efficiency

Aptitudes have prognostic value in industry. Leffel (1939) found that boys who planned to enter technical profession or semi-professions made significantly high scores on the O'Rourke Mechanical Aptitude Test than those who planned to enter other fields. Bennett, Seashore and Wesman (1955) tested 62 men for their technical aptitude on the DAT in a non-degree programme. The percentile equivalents of average scores were 37 on Verbal Reasoning, 26 on Space Relations and 49 on Mechanical Reasoning. Roe (1956) has pointed out that the skilled profession would require the highest rank
in Mechanical Reasoning and sixth in Abstract Reasoning. Referring to the General Aptitude Test Battery, Super and Crites (1962) point out "there is no measure of mechanical comprehension but we have seen that this is not a factorially pure aptitude, but rather a composite of aptitude and experience, of which spatial comprehension is the major component." According to Bennett, Seashore and Wesman (1966) students who are superior in Mechanical Reasoning, Space Relations and Numerical Ability do better in engineering courses.

Vohra's study (1977) on polytechnic students reveals an overall relationship between aptitudes and academic achievement. The correlation between aptitudes and academic achievement (external viz. Technology) ranged from .19 to .24 which was significant but the sample consisted of students of Civil, Engineering and Mechanical Branches of Engineering Education from six polytechnic institutions. The correlations between Space Relations and Academic Achievement ranged from .28 to .17 (external). The relationship between numerical ability and academic achievement was positive. Mechanical Reasoning and Academic Achievement correlated positively. Abstract Reasoning and Academic Achievement correlated positively significant except with Electrical branch.
"In the light of cited evidence, it may be expected that mechanical reasoning, abstract reasoning, numerical ability and space relations will have a positive relationship with academic achievement (especially practical) of the ISTC students and with work efficiency of the PTL and APL workers."

Personality and Efficiency

Adjustment to one's job affects efficiency considerably. Normalcy of a person is an essential condition of proper adjustment. Dwivedi (1979) has pointed out that personality disturbance on the job may be minimised and the maximum use of an individual's capabilities may be realised by proper placement. An assessment of personality traits is, therefore, of importance in organisational settings; efficiency is related to a worker's personality.

In the present research, personality is being studied in the Eysenckian framework. Eysenck (1952, 1957, 1960) defines personality as the "more or less stable and enduring organisation of a person's character, temperament, intellect, physique which determines his unique adjustment to the environment. Eysenck's personality theory (1947 through 1974) postulates four major dimensions of personality virtually independent of each other. It has been evidenced that the dimension of E/I and N apart from intelligence are more related to performance than the other two.
For the variable of personality a two-fold classification will be used in terms of Extraversion and Neuroticism for formulation of hypotheses.

(a) **Extraversion**

According to Eysenck and Eysenck (1968) "the typical extravert is sociable, likes parties, has many friends, needs to have people talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment and is generally an impulsive individual... likes to 'laugh and be merry'... His feelings are not under tight control." The introverted type is described as "a quiet, retiring sort of a person, fond of books rather than people, tends to plan ahead, 'looks before he leaps'. He does not like excitement, talks matters of everyday life with proper seriousness. He keeps his feelings under close control. He is reliable, somewhat pessimistic and places great value on ethical standards."

On the causative side, Eysenck elaborates on Pavlov's (1927) experiments with dogs, that not all dogs condition equally well due to differences in excitation-inhibition balance—both positive and molar cortical processes. Eysenck (1955) extended Pavlovian views to the typological fields of personality. He took the aid of the Hullian concepts of reactive inhibition (Ir) and Gray's (1943) first submolar principle, "all the responses leave in the physical structure... a state which acts directly to inhibit the evocation of activity... This
inhibitory substance manifests through reactive potentials. This negative action is called Reactive Inhibition (Ir), an increment of which is assumed to accumulate except as they spontaneously disintegrate with the passage of time. On the basis of these, Eysenck (1963) in his review of personality, gave evidence that differences in individuals on E/I was to be found in the constitution of the individuals especially the ascending reticular formation (ARAS) of the central nervous system (CNS). This, Eysenck (1967a) did, by relating the concept of the physiological differences between introverts and extraverts to a distinction of organisms with 'weak' nervous system and organisms with 'strong' nervous system (Gray, 1965). Introverts are supposed to have a weak nervous system and extraverts a strong nervous system. Organisms with weak nervous systems are assumed to respond at lower levels of stimulation and with greater intensity of stimuli than organisms with strong nervous systems.

Eysenck (1955, 1957) has emphasized time and again that learning and performance are related to each other owing to individual differences in consolidation of the learned responses. Eysenck (1966a) proposed a consolidation theory according to which performance sets up cortical events which in order to become available to the organism, require rest for consolidation. Also, consolidation interferes with performance in view of Walker's theory (1958) - cortical arousal.
is related to strong consolidation. Eysenck (1962 through 1971) argued that introverts are characterized by higher level of arousal than extraverts; for the poor consolidation of extraverts, it can be argued that the cortical arousal might be playing an important role. EEG studies have substantiated this (Gale, Coles and Blaydon, 1969). Eysenck (1967b) concluded that introverts typically have low alpha amplitude and high alpha frequency while extraverts typically have high alpha amplitude and low alpha frequency. These are the EEG characteristics respectively of high and low arousal.

Eysenck (1971) indicates that successful businessmen are on the whole stable introverts; they are stable regardless of what type of work they do within business, but their degree of extraversion may be related to type of work. Eysenck (1971) has found that extraversion is linked with various aspects of industrial performance. The ability of the introvert to resist boredom and persist with a task for a long period of time is valuable in certain industrial contexts. Mohan (1976) reported that extraverts are as efficient as the introverts but after a period of time their performance drops more quickly. The general indication is that on tasks of sustained attention, the extraverts are likely to show much more work decrements than introverts. Luthra (1976) found no significant relationship between extraversion and performance of industrial workers. Vohra (1977) found a negative correlation between extraversion
and academic achievement on polytechnic students.

"In the present study the nature of task is such, whether in ISTC or factory, that persistence and unitary concentration is favourable. Therefore, it may be expected that introversion may show a positive relationship with work efficiency".

These expectations about Extraversion and work efficiency may be to some extent influenced by the fact that extraversion itself has been split into two sub-parts. In their book on 'The Dual Nature of Extraversion', Eysenck and Eysenck (1969) gives evidence that sociability and impulsivity though sub-parts of extraversion, may have their unitary and independent functions too. Impulsiveness is an aspect of extraversion which shows some correlation with poor adjustment. It is a tendency to work quickly without reflection; the inability to inhibit an impulse whereas sociability is an aspect of extraversion which shows some correlation with good adjustment. It is a tendency to form friendships and associations; to join and live with others. Eysenck and Eysenck (1969) maintain that these two sub-factors are by no means independent but show a reasonably close positive relationship ($r = .468$). Roberts (1979) experimented on seven-year-olds
on the Matching Familiar Figures Test (MFFT) and found the impulsive children responding quickly but inaccurately. The observation based on children may be generalised to adults also as has been suggested by Cattell (1969). He examined personality at various ages and his results indicated some strong similarities between adult and child personalities. In the present research industrial work efficiency is being studied in relation to personality. Some expectations were framed earlier in relation to Extraversion and work efficiency. Since Extraversion has two subparts which may have their own systematic influence on performance, some expectations with regard to the effect of Sociability and Impulsivity may be framed in relation to work efficiency.

"Keeping in mind Eysenck's findings, it may be expected that in the present sample there would be a positive relationship between work efficiency and sociability and impulsivity."

(b) Neuroticism

The second major dimension deduced by Eysenck (1947) was Neuroticism. On the descriptive side Eysenck and Eysenck (1968) report that individuals scoring high on N are indicative of emotional lability and over-reactivity and likelihood of breakdown under stress. Such individuals frequently complain of vague somatic upsets of minor kind (headaches, insomnia etc.)
and also report many worries and other disagreeable emotional feelings - symptoms of nervous breakdowns.

On the causative side, the dimension of Neuroticism is associated with autonomic drive (Spence 1964; Eysenck, 1967b). The explanation of Neuroticism is taken to be neurophysiological. According to Eysenck (1963) the differences between people in emotionality or Neuroticism are mediated by inherited difference in the lability and excitability of the autonomic nervous system. Brody (1972) states, "Emotionality is thought by Eysenck to be dependent upon activity of quasi-independent physiological system called the visceral brain including the hippocampus, amygdala, cingulum and hypothalamus. Differences in threshold of activity of the visceral brain are presumed to be the physiological basis of individual differences in the Neuroticism-Stability dimension. Arousal of the visceral brain is assumed to lead to arousal of the reticular activation system (RAS) but not the converse (Brody, 1972) Neurotics are assumed to have low threshold of such activation.

The nature of the task has a significant role to play regarding the relationship between Neuroticism and performance. According to the Yerkes-Dodson Law (1908), tasks which are simpler in nature are performed better by anxious subjects, and tasks which are complex are performed better by low anxious subjects. Eysenck and White (1964) have provided the basis for this - Neuroticism is an autonomic drive and under a complex
condition this drive evokes a stressful situation (Lazarus, Osler and Deese 1952, and Madan 1967) which impairs the performance of neurotics. The Iowa studies (Taylor, 1951; Spence and Taylor, 1951, 1953; Spence and Farber, 1953; Taylor and Spence, 1954; and Spence and Spence, 1954) have provided evidence that anxious subjects perform better on simpler tasks by showing that with a simple task like eyelid conditioning anxious subjects conditioned better than low anxious subjects.

Eysenck (1967a) and Mohan, J. (1977) found that executives in general business organization score high on Neuroticism.

Savage (1962) predicted that the higher the academic success, the lower the neuroticism score and he found that neuroticism was negatively correlated to examination results. Vohra (1977) found a significant negative correlation (−.21) between neuroticism and academic achievement of polytechnic students. Mohan and Kumar (1979) administered the SPM to postgraduate university sample comprising of stables and neurotics, and reported that as the complexity of the task increased the performance of the neurotics dropped and a significant negative relationship emerged.

"Following the precepts of the Yerkes-Dodson Law (1908), review of cited literature, and taking examination results as an index of academic achievement of the ISTC student, it
may be hypothesized that the subjects high on Neuroticism would show poorer performance than those scoring low on Neuroticism. Hence neuroticism and academic achievement may yield a negative correlation. As regards the industrial workers neuroticism and work efficiency may be negatively correlated."

Motives and Efficiency

In industry, conditions being identical for all, there are individual differences in productivity, which are within the individual. As Dwivedi (1979) observes, the higher the level of motivation of workers, the higher their productivity potential. To achieve optimal level of results from the workers, the management must lucidly comprehend the level and nature of motives. Referring to motivation Berelson and Steiner (1964) say that it is all the inner striving conditions which have been described as wishes, desires, drives etc. It is an inner condition which activates or moves. In organizational settings, Hodge and Johnson (1970) refer to motivation as "willingness of an individual to react to organizational requirements in the short run." The needs for achievement, affiliation and power have great significance in industry. Of the three, achievement motive has a more significant influence on the success and failure of industrial enterprises than any other motive (McClelland 1961). The hypotheses for the three motives will have to be deduced separately.
(a) The Need for Achievement (nAch)

Koch (1965) reported that the success of fifteen Finnish companies was partly due to the high achievement motivation of the executives. Mukerjee (1968) found nAch positively related to scientific productivity. McClelland and Winter (1969) present evidence in support of the view that people with high nAch not only get into entrepreneurial occupations, but also tend to behave in more expansive and successful ways. Durand (1975) confirmed the positive relationship of nAch and performance on black businessmen. Phutela (1977) found that nAch has been identified as the significant predictor of the academic achievement in five samples of students. Luthra (1976) found a significant relationship between nAch and productivity on industrial workers.

"In the light of the aforementioned studies it can be expected that the need for achievement should be positively related to efficiency."

(b) Need for Affiliation (nAff)

Very little research has emerged on the nAff in organizational settings. According to Dwivedi (1979) high affiliation motive must be accompanied by high nAch in the leader otherwise he is likely to sacrifice standards of performance for the sake of his popularity and be exploited by his subordinates.
"At best only a null-hypothesis can be framed with regards to the relationships between nAff and work efficiency".

(c) Need for Power (nPow)

According to Wainer and Ruben (1969) the power motive also has relevance to performance among entrepreneurs. They found that high performing firms were headed by entrepreneurs having a combination of both high achievement and lowered power needs. Durand (1975) found entrepreneurs who exhibited high levels of business activity were those who had high achievement and lower power needs.

"The technical personnel who are subordinate to higher executives will have lower power needs. Therefore, it may be expected that both the ISTC and factory personnel will have lowered nPow."

Bowen (1973) reported that the three motives viz., nAch, nAff and nPow are generally uncorrelated. This study was conducted on Indian businessmen and managerial personnels.

"It can also be expected that the three needs are uncorrelated."