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HR DIMENSION IN INDUSTRIAL ENGINEERING

(With special reference to Power Projects Construction)

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ABSTRACT

This paper presents a holistic view of HR Dimension in Industrial Engineering. Industrial engineering is human effort engineering and systems efficiency engineering, which is related with management of human resource activities. HRM has significant influence in the construction industry. Power sector is one of the specialised sector which employs diverse groups of people from a wide range of occupations including skilled, semi-skilled consisting of engineers, managers, professionals etc. They work as teams to complete the project. Human issues are very challenging. HRD in the power sector demands a very comprehensive and pragmatic approach. Exclusively in power sector construction, technical man power and high level managerial skills are required in the areas of planning, management, monitoring, financing and contracting. Specialized training is also required in the fields of trading, carbon credits etc.

One of the biggest problems faced by today's global power industry is shortage of man power, especially trained man power. Most importantly there is huge deficit in infrastructure for managerial training. Career advancement and training opportunities are to be emphasised. Experienced professionals are required for critical activities and adequate capacity building measures need to be undertaken to ensure the availability of man power required for completing the projects.

Keywords: Construction industry, HRM, Industrial Engineering, Power Sector, Training.

I. INTRODUCTION

Industrial engineering is a branch of engineering applied to the planning, design and control of industrial operations. Industrial Engineering may be defined as the art of utilizing specific principles, psychological data and information for designing, improving and integrating industrial management and human operating procedures. (Nadler,1955)

American Institute of Industrial Engineering (AIIE) adopted the following definition of Industrial Engineering in 1955.

"Industrial engineering is concerned with the design, improvement, and installation of integrated systems of men, materials, and equipment. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design, to specify, predict, and evaluate the results to be obtained from such systems."

The human factor in the Industrial Engineering was highlighted by Lehrer. Lehrer stressed on the unique characteristics of Industrial Engineering center about the consideration of the human factor as it is related to the technical aspects of a situation, and the integration of all factors that influence the overall situation.

"Industrial Engineering is Human Effort Engineering and System Efficiency Engineering. It is an engineering-based management staff-service discipline that deals with the design of human effort and system efficiency in all occupations: agricultural, manufacturing and service. The objectives of Industrial Engineering are optimization of productivity of work-systems and occupational comfort, health, safety and income of persons involved."(Narayana Rao, 2011)

The above definition of Industrial Engineering focuses on the two key aspects viz., human effort which is related with the human factor and the systems efficiency which deals with the design and productivity factors. The former is concerned with the management of human resource activities which includes personnel policies, staffing, organizing, controlling etc.,; and the latter deals with the technical aspects of the product /process or the services.

In the present day scenario of rapid industrial globalization, the organizations, in order to maintain the competitive position in the market and also to meet the demands of the client, are exploring and adopting state of art technologies related with the product & process and also the human resources management (HRM) techniques.

II. ROLE OF HRM IN INDUSTRIAL ENGINEERING

The industrial engineers have a vital role to play in design aspects of the efficient product/process. In addition they also have to take a major leading role in the human resources management as they are the part of the project management teams which they have to lead. The relation between the various employees as a part of the systems engineering has a significant role to play in the success of any project.

The basic objective of human resource management is to contribute to the realization of the organizational goals. HRM is concerned with the personnel policies and managerial practices and systems that influence the workplace. In broader terms all decisions that affect the workforce of the organization concern the HRM function.

Importance of personnel management is in reality the importance of labor functions of personnel department which are indispensable to the management activity itself. People are individuals who bring their own perspectives, values and attributes to organizational life, and, when managed effectively, these human traits can bring considerable benefits to organizations. (Mullins 1999)

III. HR IN CONSTRUCTION INDUSTRY

The construction industry accounts for a sizeable proportion of worldwide economic activity. Construction activity is extremely diverse in nature ranging from a simple construction to highly complex infrastructure projects. Construction is a project-based industry which brings together various combinations of clients, designers, constructors and suppliers for relatively short periods of time i.e., till completion of that particular project.

Human resource management has a significant influence in the construction industry. Despite of sophistications in the construction technologies and management techniques, construction remains one of the most people-reliant industrial sectors. The construction industry employs extremely diverse group of people from a wide range of occupations including un-skilled, semi-skilled, skilled consisting of engineers, managers and professionals. These diversified groups in concert form a labour foce, as a team work, operate to complete the objectives of the said particular project. These features make construction activity one of the most challenging environments in the field of managing people effectively. Therefore, project managers still need to pay more attention to people management. Human resources still account for the majority of costs in most construction projects (Loosemore, M., Dainty, A. and Lingard, H. (2003).

Construction projects form autonomous business units with their own multifunctional teams and objectives, and this inevitably means that line managers must take on responsibility for aspects of the HRM function. Mullins (1999) points out that line managers are typically trained as specialists in their own discipline but do not receive the people-management skills needed to manage their function effectively. He argues that production-oriented management skills are seldom enough to meet the psychological needs which define an effective employment relationship.

In the construction industry, a company needs project managers to make HRM decisions at the project level (Loosemore, M., Dainty, A. and Lingard, H. (2003)). Therefore, project managers need to depend on the natural characteristics of projects to establish a specific strategy that is suitable for the needs of employees at the project level. Since project success is nearly always measured in monetary terms, people-related issues become a second priority to the core procurement challenges of meeting time, cost and quality targets. (Loosemore, M., Dainty, A. and Lingard, H. (2003)).

In the recent times, Govt. of India has stepped up into the execution of infrastructure construction projects like Metro Rail, River interlinking project, sea ports projects, Highway Project (Golden quadrilateral, North-south & East-West corridors etc.,) and construction of power projects through the state power utilities.

The construction industry everywhere faces problems and challenges. However, in developing countries like India, these difficulties and challenges are present alongside a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues. There is also evidence that the problems have become greater in extent and severity in recent years. (Arghadeep Laskar and C. V. R. Murty 2004)

IV. HR IN POWER SECTOR

Amongst the construction industries the projects related to Oil & Natural gas sector and power sector may have to be considered the most critical and highly sophisticated. The power sector in India has witnessed a few success stories in the past years. Overall generation in the Country during 2013 – 14 was 967.15 BU (Billion Units) as against 912.057 BU during 2012 – 13. The annual growth in the power sector was 6.04% during 2013 – 14.

The per capita energy consumption is also one of the main indices for measuring the development of the economic growth of any country. The per capita consumption of electricity in the country has increased from 15.6 units in 1950 to about 766 units during the year 2009-10. The National Electricity Policy of the Government of India

stipulates that this is to be increased to over 1000 units per annum in 2012. The per capita energy consumption over the past years is represented graphically below.

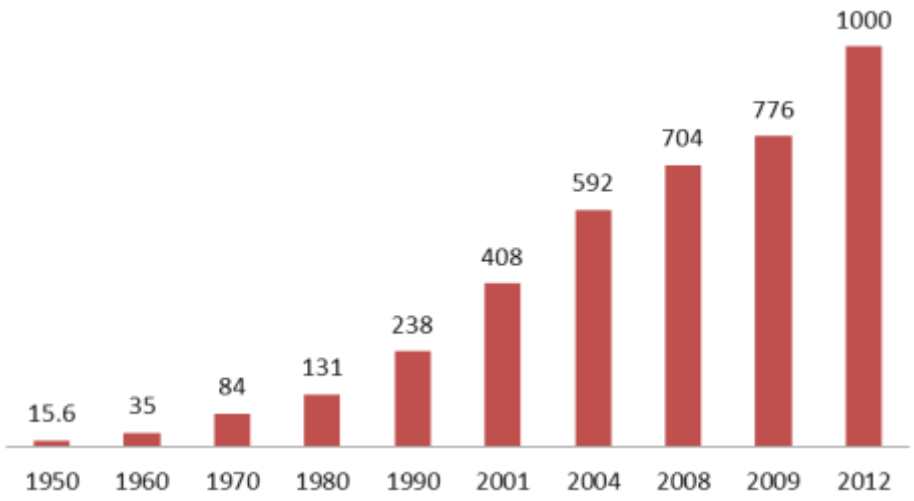


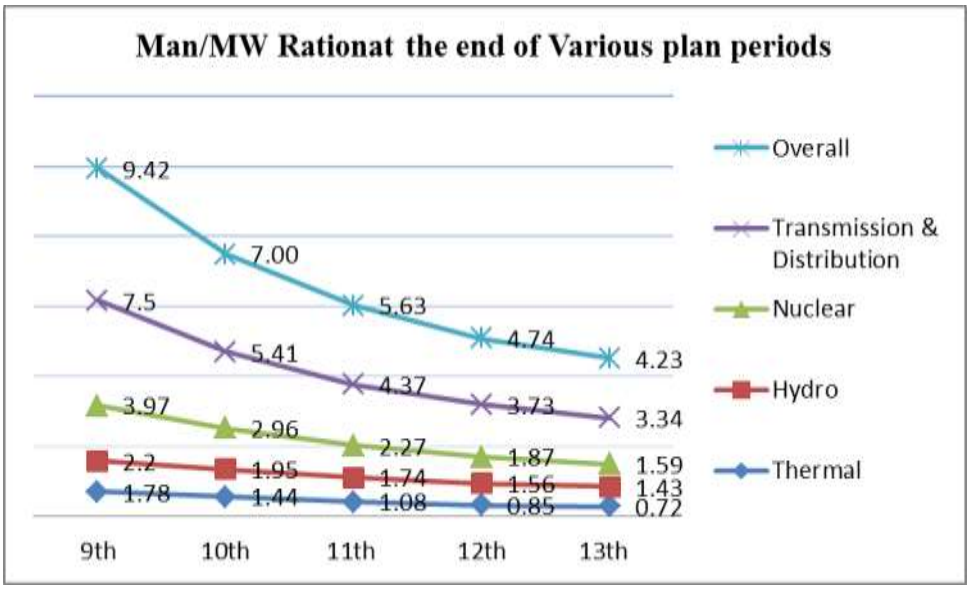
Fig.1 per capita electricity consumption (kWh)

The trend of increasing power consumption is clearly evident from the above graph. But the capacity addition required for meeting the increasing demand is not being met. There is always been a gap between the demand and supply. Government of India has made an action plan to provide power to all and has taken many initiatives in this direction. In order to bridge the existing gap between demand and supply and to meet the future requirements, there is a need of enhancing the installed capacity to about 275 GW by 2017.

Man/MW ration during the various plans, based on the projections of capacity addition and corresponding requirement of manpower during various plans in are as projected below:

Table.1

End of the Plan Period	Thermal	Hydro	Nuclear	Transmission & Distribution	Overall
9th	1.78	2.2	3.97	7.5	9.42
10th	1.44	1.95	2.96	5.41	7.00
11th	1.08	1.74	2.27	4.37	5.63
12th	0.85	1.56	1.87	3.73	4.74
13th	0.72	1.43	1.59	3.34	4.23



The Challenges in HR are many folds and most demanding in power sector. Technically trained manpower comprising of skilled engineers, supervisors, artisans, and managers etc. is required in every sphere of the power sector. All the skills are to be regularly updated to cope up with the rapidly advancing technologies. Growing concern over environmental degradation and depletion of the conventional energy sources has made the task of electricity generation even more challenging and therefore quality standard of the manpower is becoming increasingly essential.

In India for establishing and operating a Thermal Power Plant needs to cross about 65 Steps rather approvals or clearances from various government and other statutory organizations. These include right from the inception of the project by appointing a consultant for preparation of Detailed Project Report to the land acquisition formalities, environmental clearances, water allocation from the nearest water resource, long term coal linkages from coal India and finally the agreements for the power purchasing with various consumers. The involvement of the top management of the organization in appointing the consultant rather getting the work done through the already engaged staff plays a vital role in completion of the project.

The above said works like getting the environmental clearances which involves preparation of environmental assessment reports etc. needs expertise in that particular field. As any organization cannot engage all the expertise required for a short period, it is always worthwhile to engage the services of the required experts for the short period for carrying out the task.

Human Resource Development and capacity building, in the present power scenario, demands a very comprehensive and pragmatic approach to attract, utilize, develop and conserve valuable human resources. Training, re-training and career prospects are some of the important elements of human resources development.

The major hindrances faced by any power sector during construction of the project are:

1. Poor co-ordination between the contactors since there will be numerous packages to be handled.
2. Due to this poor coordination many re-workings will result which not only enhances the overall project costs but also the targeted commissioning schedules are also not adhered to ultimately running to cost and time overruns.
3. Because the owner will not have the flexibility of enhancing the labour force at his requirement at the required areas.
4. Availability of the required manpower.
5. Engaging the required labor force and retaining them till the works are completed.
6. Ensuring the technical standards of the processes.
7. Follow-up of materials and sequential dispatch of the materials to site.

4.1. HRM adopted in erstwhile unified APGENCO

4.1.1. Confront-1

For establishing a thermal power Unit usually apart from boiler, turbine, generators (BTG) equipment which constitute major portion, 18 to 20 more packages, apart from the civil works, are required for successful operation of the Unit. Hence the tendering process was to be done for all these packages. Thus massive manpower required for this task and further execution. There was a deficit of the engineering staff in the erstwhile united APGENCO.

Therefore the then Unified APGENCO management, when decided to take up the execution of the 500 MW Unit at Vijayawada, has decided to go ahead with two EPC contracts, one for the BTG equipment and another clubbing all the other packages including civil works into a single EPC package.

The two major advantages of this method of execution were, one as there are only two contractors viz BTG and BOP the contract co-ordination from the owner's side is simple and second the total number of total staff required from the owner's side will be reduced considerably.

4.1.2. Confront-2

As discussed earlier, construction of a power plant involves wide variety of labour including welders, fitters, tuners, masons, bar-benders, electricians, helpers etc., During 2005 till mid 2008, India has experienced a rapid growth in the industrial sector especially in the field of power. Due to this there was a huge scarcity of labour forces at all levels starting with skilled, semi killed and un-skilled. Retaining the labour during this period was a really a challenging and burdensome task.

But in order to commissioning the Unit in time, the management of then Unified APGENCO has taken a decision of paying incentives and further absorbing certain labours into the organization. This had worked in a tremendous way in retaining the labour.

Not only the above, during the said period between 2005 and 2008 many of the experienced persons from various organizations like BHEL, NTPS have left the organizations in search of new endeavors. The management of the

then Unified APGENCO has engaged the services of such experienced staff in order to ensure the quality of construction.

4.1.3. Confront-3

Because of rapid industrialization environment existing the country during 2005 to 2008, all the major suppliers of the equipment were immensely flooded with orders. Obtaining the material from their works to the site was also challenging. Because they were diverting the materials depending on their own prioritization.

Hence, a team of engineers were camped at the sub-vendors works for follow up of the materials and also to ensure that the materials required are dispatched sequentially to our project site only without undergoing any diversions.

4.1.4. Confront-4

The training for the engineering workforce and other labours were also provided in the APGENCO's training institute at Vijayawada for handling the situations and also on the safety aspect to be followed during the construction activities.

V. NEED FOR HR TRAINING IN POWER SECTOR

The engineers or line managers will be managing the things on site with the management skills they possess inherently depending on the situation. But the same may not be the situation with the others who do not possess these skills. Thus a proper training in the relevant area either technical or HR is essentially required for meeting the day to day challenges.

Exclusively in power sector construction in addition to the technical manpower, highly skilled managers will be required in areas such as planning and management, monitoring, financing, contracting the project and also executing the project as per the standard practices. Specialized knowledge is also required in analyzing filed of power trading, carbon credits, smart grids etc. . All these can be made possible with specialized training.

Lack of training infrastructure is also one of the key roles in ensuring adequate manpower for the sectors. Further infrastructure for Refresher Training required for updating skills and knowledge is not given importance which is a key reason for inadequate availability of manpower with right skills and competencies. Most importantly, there is huge deficit in infrastructure for managerial training. Organizations need to understand how their employees develop, both through formal education and training and through the process of job transition that drives their careers. Career advancement and training opportunities were to be highly emphasized.

Experienced professionals are required for critical activities and it is difficult to augment the number of such professionals in a short period of time. Hence adequate capacity building measures need to be undertaken to ensure the ready availability of manpower required for achieving the targets.

VI. HUMAN RESOURCES DEVELOPMENT IN POWER SECTOR (12TH PLAN)

As per the Report of working group on power for 12th plan, sufficient number of Engineers, Managers and Diploma holders are available. However, in respect of lower level skills like that of ITI, there are certain gaps.

Keeping in view of the above situation, the planning Commission for achieving the targeted capacity addition of 1,23,900 MW (including renewable) in the 13th plan, projected the additional manpower requirement as 547.78 thousands out of which 419.04 thousands will be technical and 128.74 thousands will be non-technical. The 13th plan has focused mainly on the training and training infrastructure requirement for the manpower required in the power sector. Allocation of Rs 2473.41 Crores has been made towards the annual recurring cost towards training fees.

The some of the achievements made in imparting the training schemes during the 11th plan are:

1. Advanced Certificate in Power Distribution Management (ACPDM) - Course was developed by IGNOU in association with NPTI and delivered by IGNOU in distance mode through multiple regional centres spread across the country. The course is meant for Graduate Engineers/Diploma holders, or Science/Commerce/Art Graduates or Equivalent with two years experience in Power Utilities or the Electricity Sector.
2. National Power Training Institute (NPTI), under the Ministry of Power, Govt. of India is a National Apex body for Training and Human Resources Development in Power Sector imparting training to Power Professionals in regular Programs. Training is also being imparted through Simulator.
3. The Power Management Institute (PMI), NTPC's apex training and development centre has been imparting training in the fields of management development, construction and O&M of power plants and information technology.

Recommendations of Planning Commission:

1. It is proposed that all Central Sector Utilities, all state Sector Utilities and all IPPs should create sufficient Training Infrastructure for providing O&M training as per the norms stipulated in notification of September 2010 issued by CEA.
2. Additional training Infrastructure should also be created by Organizations like NPTI & Training Institutes of other Utilities and they should also augment their existing Training Institutes for meeting the increased training requirements of the Power Sector.
3. All existing nine Institutes of NPTI should be augmented for which estimated cost for augmentation per Institute is Rs. 50.00 crore and for nine institutes it works out to Rs. 450 crore, for which necessary Plan funding may be provided by Ministry of Power.

VII. CONCLUSION

One of the biggest problems faced today by the global power industry is shortage of manpower. The problem is more acute for Indian industry, especially the PSU's of India, because of constraints in paying competitive remunerations to its employees and their HR factors, which lead to attrition.

IT and BPO industries in India have managed to grow despite a very high rate of attrition. Some of the successful strategies adopted by high performing IT and BPO companies may be successful in Indian PSU's. Strategies for employee retention should include money and other factors for increasing commitment level. Besides the retention strategies, thrust on recruitment and steps to increase availability of talent with the help of academia, imparting regular and specialized training and government support are considered important for the growth of power sector for supplying uninterrupted and qualitative electrical energy.

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