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The Organization of Plant Turnaround Maintenance in Process-Based Industries: Analytical Framework and Generic Processes

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Abstract

Plant turnaround maintenance is a fundamental asset management in capital intensive process-based industries. The successful implementation of turnaround maintenance among others depends on the appropriate provision of institution and organization for the governance of the event. However, it is not uncommon for senior management of these companies to focus their attention on the engineering, business, and economic aspects of the event. This tendency has left several gaps in the knowledge and understanding of the organizational dimensions of this event. To a remarkable degree, it is rare to find literature on organizational characteristics of plant turnaround maintenance. This paper proposes an analytic framework for examining the organizational dimensions of the plant turnaround by describing six core generic processes through the general concepts of institution and organization namely rules, roles, and groups. The generic processes include formation of turnaround maintenance organization, resource mobilization and management, communication, conflict management, contracts management, and relationships with external organizations. The framework provides means for the understanding of turnaround maintenance organization from the social science standpoint that was scarcely addressed in the management circles.

Keyword: Plant turnaround maintenance, rules, roles, and groups, organization, generic processes

Introduction

Sociology has in the last few decades witnessed scholarly interests and studies of institution and organization in various organizational environments. In light of this trend, it is surprising to find still-disparate literature on the institution and organization of plant turnaround maintenance. It is a subject worthy far more attention than it has received from scholars for it raises plethora of important issues about the temporary nature of the organization, resource allocation and mobilization, conflict management and resolution, communication, legal environments, and relationships with external organizations. Plant turnaround maintenance is an important asset management and unique to the process-based industries. It is an activity that is aimed to revitalize, maintain, and improve the plant facilities for optimal and efficient operations. As a task-oriented event, it demands large number of people and other physical resources on temporary basis in executing the event. Despite the difficulties in planning the event, having relatively predictable pattern of human activities to meet the objectives of the turnaround maintenance is crucial. As any form of human organization harbors the seeds of conflict, the task of conflict resolution and management, communication, and coordination are pertinent. This is facilitated by a system of organization and institution which consist of structure or mechanism of organizational order and

cooperation governing the behavior of the people and groups of people within the turnaround maintenance organization.

To a remarkable degree, the institutional and organizational aspects of plant turnaround maintenance are scarcely understood and narrowly explored subject in the management circles. In spite of the extensive body of research on organizations in the manufacturing and services environment, very limited studies are available on institutional and organizational dimensions of turnaround maintenance. Indeed, numerous studies in practically all aspects of management and business both by local and foreign scholars have failed to attract organization of turnaround maintenance as a topic worthy of research enquiry. In comparison to the accrued knowledge on turnaround maintenance from the engineering perspective, rather limited knowledge is available with respect to the organizational dimensions of one of the most important and critical activity in plant management.

One explanation for the apparent lack of interest is the difficulty in accessing data and other relevant information relating to the turnaround. Another reason and the more pertinent one is that turnaround maintenance is only known in the engineering circles whereby the research interests are on the technical domain rather than organizational and institutional dimensions. The temporary nature of the event and the perception of its prevailing engineering activities that does not encompass social environment have led to the insufficient thought given to this subject among the social scientists.

Nevertheless, whatever studies available on turnaround maintenance are descriptive and highly narrative in nature. Written by former engineering consultants and those familiar with the technicalities of the turnaround processes, their reports are descriptive in nature and did not go beyond their individual experience pertaining to turnaround organization. The central theme to their writings focused on the methodology of the turnaround maintenance that they have developed over the years. These tendencies have left several gaps in the knowledge of organizational dimensions of turnaround maintenance.

This paper proposes an analytic framework for examining and describing the generic processes of turnaround maintenance with emphasis on social, as opposed to technical aspects of the plant turnaround maintenance. The institutional and organizational dimensions of the turnaround maintenance are analyzed using the fundamental sociological concept of rules, roles, and groups. These concepts provide the understanding of the generic processes in turnaround maintenance organization from the social science standpoint. Essentially, this paper serves the interests of two parties. Firstly, the scholarly interest with the study of organizational arrangements vis-à-vis the relationships between people in managing important organizational resources in the context of plant turnaround maintenance environment. Moreover, the framework can be used to conduct comparative analysis on the various generic processes in the turnaround organizations irrespective of the types of technology and industries. Secondly, the practical concern with creating appropriate organization that will facilitate successful implementation of the turnaround maintenance event.

Plant Turnaround Maintenance

Plant turnaround maintenance or simply 'turnaround' in technical circles is normally carried out

during a planned plant shutdown. Depending on the technology of the plant, the turnaround frequency varies from once a year to once in six years. Plant turnaround maintenance from the engineering point of view covers activities such as inspection, overhaul, modification, and the installation of new parts or equipments. Taking advantage of the plant shutdown, project works, preventive maintenance, corrective maintenance, and plant cleaning are also carried out. The turnaround event is duration driven and the frequency is largely determined by variables such as plant technology, the required level of plant reliability, and the legal requirements associated with the operation. The duration of turnaround event is short and utilizes large manpower resources that include engineers, technicians, craftsmen, skilled and specialist maintenance contractors. The enormous magnitude of inter-related activities of the turnaround event requires stringent control and coordination. The scope of work involved in turnaround exhibits considerable variations among plants. It is dependent upon, among others, the age and type of plant technology. Perhaps, the most distinctive aspect of turnaround is that the scope of work remains uncertain until the actual activities begin. Despite a series of inspections and assessments that were carried out prior to the turnaround event, the actual condition of the equipments simply could not be determined until they are actually opened and inspected. As such, it is not uncommon to have unanticipated or emergent work. The situation harbors the risk of work scope growth leading to the lengthening of the turnaround period and cost escalation. The monetary loss due to production stoppage is often huge if the planned duration of the shutdown is exceeded.

Viewing from the business perspective, plant turnaround maintenance affects a company's business operations in more ways than one. The successful implementation of the plant turnaround maintenance contributes to the profitability of the company (Lenahan, 1999; [Murthy et al., 2002](#)). There are a number of facets to this connection that will serve to set the turnaround maintenance in a business context. Firstly, assets are critical for business success in the fiercely competitive global economy ([Murthy et al., 2002](#)). Rapid changes in technology have resulted in equipment becoming more complex and expensive. Businesses incur heavy losses when their equipment is not in full operation, hence, the need for availability and reliability of assets. Financially, the turnaround event is expensive to execute and it is not uncommon for the activity to be funded by the company's retained earnings. Furthermore, as the event entails plant shutdown, loss of production is unavoidable. Company's revenues are negatively affected and consequently its profits. As a matter of fact, the event has negative impact on the profits of the company in the year the turnaround maintenance is performed. Secondly, plant turnaround maintenance also has a peculiar impact to the business of a company. The event poses potential hazard to plant reliability, safety, and harbors the risk of cost overruns and schedule slippage due to technical uncertainties. In addition, the turnaround maintenance requires a large number of personnel (maintenance and support) and requires other costly resources in large quantities such as spare parts, machines, tools, and equipment. These requirements reach the highest level at the peak of the implementation stage. Cumulatively, the event drains off a company's resources. Therefore, plant turnaround maintenance is very much a business process and is increasingly explored as an area that can be enhanced to increase productivity and sustain competitiveness of the company. Plant turnaround maintenance is considered as a value adding investment. Due to the huge turnover of the operation and massive capital investment of the assets, it is increasingly regarded as one of the business strategies of a company in the highly competitive business environment. How asset and maintenance management makes good business sense has, of late, become an important management issue that has drawn attention from various parties of business

and industries ([Liyanage and Kumar, 2003](#)).

Plant turnaround is an event that demands huge manpower from internal and external sources on a temporary basis in executing the maintenance activities. They include planners, technicians, inspectors, engineers, managers, contractors and suppliers. This is essential due to the large amount of work that needs to be carried out in a very short time frame. Hundreds, even thousands of maintenance man-hours will be required depending on the volume of the work and the window of opportunity available. In addition it is not uncommon to have foreign workforce and specialists during the execution of the turnaround maintenance. This workforce diversity consequently brought different cultural values and practices such as work-related values, management styles, communication, and conflict management. Adding to the cultural complexity, the event consists of multiplicity of inter-related activities, performed at the same time, in the same place and at times on different levels of the plant. Area congestions increase the chances of potential accidents, conflicts, errors, and confusion that are greater compared to normal maintenance environment. In addition, there are inevitably conflicting demands in the process of executing the turnaround maintenance activities such as conflicting objectives placed between cost and duration, and duration and safety. Furthermore, the highly regulated operational environment, the need for integration and coordination of multiple interfaces across the turnaround maintenance activities further suggest the complexity of organizing the event. These depictions imply that managing and organizing manpower is important to the turnaround maintenance organization. Therefore, it is unequivocally important to have appropriate organizational culture that acts as enabler and coercer in facilitating the turnaround organization to move together in executing the complex event, while at the same time maintaining the responsiveness in adapting to internal and external uncertainties.

The demand placed on management functions in plant turnaround maintenance such as planning, organizing, and controlling is overwhelming in comparison with those found in “normal” business operations. Essentially, at least three major aspects of the organization and management of turnaround maintenance differentiate it from ongoing business operations. Firstly, turnaround maintenance is usually carried out with the singular objective of restoring plant reliability and production processes and the result is realizable in a short time period. On the contrary, ongoing business operations often have multiple objectives and some will only be realized in the future. Secondly, the manpower requirement for turnaround maintenance varies greatly from ongoing business operations. Initially, a turnaround event requires only a few key personnel for a short period to identify and finalize the scope of work of the turnaround. The requirement and number of personnel steadily increases as the event progresses to the planning and preparation stage. The number of personnel reaches its peak during the execution stage, whereby the manpower requirement may reach to a level of 1,000 or more depending on plant size, plant technology, and the scope of work. Subsequently, the number of personnel tapers off at the tail end (termination stage) of the turnaround event. Such a scenario differs greatly from ongoing business operations where the manpower requirement is relatively stable due to the consistent level of activities over a considerable period of time. Finally, the temporary nature of the turnaround maintenance organization is another distinct feature in comparison to ongoing business operations. In the organization of turnaround maintenance a team is assembled for the planning, preparing, and executing the event. Depending on the size of the turnaround, the team may consist of plant personnel, hired specialists and skilled tradesmen. The majority of the personnel involved may be

sourced from contractors. The team is disbanded after the successful completion of the turnaround event. However, some of the larger concerns retain a few key personnel to plan and prepare for the next cycle of turnaround event. The temporary nature of the organization is certainly not the case for ongoing business operations that place heavy reliance on relatively permanent and stable organizations.

Plant Turnaround Maintenance Institution and Organization

Generally, an institution is an organization or system of organization that consists of an embodied structure of human roles (group or individual) that are defined in terms of tasks, and rules regulating the performance of those tasks ([Coward, 1980](#)). A part from this explicit rules and roles, implicit and informal dimensions namely institutional culture is also important. They include attitudes, values, and norms that pervade the organization. However, this paper limits the discussion to the former two elements of institution. On the other hand, an organization consists of people and groups of people. It may be defined as consciously coordinated social arrangement, systematically organized to meet a need or pursue common goal or set of goals ([Hall and Tolbert, 2005](#); [Pradhan, 1989](#)).

The basic concepts of rules, roles, and groups as explain above, are useful in understanding the institutional and organizational dimensions of turnaround maintenance or attempting to improve the organizational arrangement. To be useful, however, these concepts need to be matched with the fundamental generic processes in the turnaround maintenance. The authors' associations and experiences dealing with plant turnaround maintenance have led to the identification of six core generic processes in plant turnaround maintenance irrespective of the types of technology and industries ([Zulkipli *et al.* 2010a](#); [Zulkipli *et al.* 2010b](#); [Zulkipli *et al.* 2009](#); [Zulkipli *et al.* 2008a](#); [Zulkipli *et al.* 2008b](#); [Zulkipli *et al.* 2007](#)). While many tasks must be organized to ensure successful implementation of the event, the six are significant in this temporary nature of organization. They are (1) formation of turnaround maintenance organization, (2) resource mobilization and management, (3) communication, (4) conflict management, (5) contracts management, and (6) relationships with external organizations. The analytic framework is shown in Table 1.

Following this framework, one would for example, seek to identify the rules pertaining to resource mobilization and management in the turnaround maintenance organization. One can ascertain the major roles involved in determining and deciding the work scope of the turnaround, approving, organizing and mobilizing the resources, and supervising the resource utilization. Next, the important individuals and groups of individuals that are involved in planning and executing the turnaround maintenance can be recognized. A similar approach would be outlined in examining the task of forming the turnaround organization, communication, conflict management, contracts management, and relationship with external organizations.

Thus, the institutional and organizational background of the turnaround maintenance can be seen to refer to the rules, roles and behavior of the people and groups of people involved in the event. A major purpose of the turnaround maintenance institution and organization is to effectively organize the people and physical resources to execute the turnaround. Hence, it is important for the management to establish rules and create patterns of behavior that are in harmony with the

organizational environment to ensure successful implementation.

1. Formation of Turnaround maintenance Organization

One of the fundamental generic processes of turnaround maintenance is the formation of an organization to effectively and efficiently perform the various types of maintenance activities. It involves the division of people by task, their grading by rank, and also their arrangement by role and responsibility. In essence, it is the matching and ordering of the human resource component to the workload of the turnaround maintenance in the form of hierarchy as normally depicted by the organizational chart. This process involves many inter-related decisions that are influenced by many conflicting factors. As stated by Kelly (1997), these decisions can be categorized according to the following elements:

- The resource structure namely the mix, size, function, and logistics of the maintenance resources primarily the manpower
- The administrative structure that identify the managerial responsibilities and inter-relationships
- The short-term and long-term planning and control system

As there are varieties of options in managing and executing the event, a number of rules or principles influence the design of the organizational structure. Firstly, the top management has to appoint a turnaround manager to manage the whole event. This person can be either selected from the company's own management staff, or an appointment from consulting company, or entirely managed by a contractor. Secondly, the top management has to decide who will execute the turnaround work. There are various options available. The entire work package can be outsourced to one contractor or the company can split the work packages and employ several contractors to implement the work accordingly. Alternatively, the turnaround can be executed by the company's own maintenance and engineering personnel. The decision on preferred alternative is constraint by a variety of internal and external factors. For instance, the resource and administrative structure depend on the workload, the duration of shutdown, the financial constraint, technology of the plant, and other preconditions from functional departments such as finance, production, marketing, occupational health, safety, and environment and human resource. On the contrary, trade union agreements, statutory requirements, safety and quality standards, availability of contractors and specialists, and other contractual obligations with customers as well as suppliers do exert significant influence.

As an illustration, the resource and administrative structure of the turnaround organization has to comply with the rules, laws, and regulations imposed by the Department of Safety and Health (DOSH). Accordingly, few functional units have to be established to manage and organize the maintenance, tests, and inspections of all the registered facilities, machines and equipment that are regulated by DOSH (Zulkipli, 2010).

2. Resource Mobilization and Management

The planning and execution of turnaround maintenance require people with skills and experience and other resources. Resource mobilization and management are prominent task in plant turnaround maintenance. In fact, inadequate resource is one of the major causes of scheduled

slippage. Varieties of resources are organized and mobilized during the turnaround event. Broadly speaking, they encompassed physical, financial, and people. Some are measured by the hours (days) such as manpower, rental of heavy equipment, specialized tools and instruments. Others are quantified by weight, quantity, or volume that includes parts, materials, and supplies. Other temporary auxiliary facilities and amenities are provided as well. They include among others parking area, site office, first-aid facilities, cafeteria, meeting rooms, assembly area, workers amenities, prayers room, and storage areas. Even though some are internally available, it is not uncommon that large sum of the resources is obtained externally. For instance, large numbers of maintenance workers are usually supplied by contractors. The demand for manpower begins the moment senior management make the decision to initiate the turnaround. The demand increases as the turnaround moves to preparation and planning phase. Following that, the demand peaks at the execution phase and there on reduces until the tail-end of the termination phase.

The rule is to have minimum level of resources to perform the maintenance work in ensuring sustainable efficient operations of the plant until the next scheduled shutdown. Two major attributes of resource mobilization are quantity and sequence or timing (Kelly, 1997). As turnaround is a temporary setting, it is crucial to have sufficient resources for the peak need and shed them as soon as they are not required. Moreover, in view of the fact that turnaround is conducted in confined areas of the factory, timing and sequence of the resource mobilization is essential to minimize congestion. In addition, the turnaround duration is compressed. For this reason, the availability of resources vis-à-vis the right quantity at the right time and place is vital.

The process of resource allocation and mobilization are influenced by the internal and external forces that shaped the plant turnaround maintenance. The process is constraint by internal factors such as strategy of the organization, its financial concerns, structural context, and human capital vis-à-vis knowledge and experience. External stakeholders include among others the customers, government authorities, and the local community. As an example, the legal requirements pertaining to statutory plant inspections regulate the interval between plant shutdowns for turnaround. A plant that executes turnaround once in five years will certainly need to allocate and mobilize larger scale of resources than a plant that performs turnaround maintenance on a more regular basis, approximately once in two years. The relative size and extent of manpower mobilization depend on the work scope and duration of the turnaround. As an illustration, three petroleum refining plants organized their turnaround once in six years, once in three years and once in five years respectively. They allocated between 18 to 25 days for the event. Due to the high volume of work, the turnaround events were planned 18 to 24 months before the event. The companies spend in the region of RM30,000,000 and employed 1,500 maintenance workers to execute the activities. On the contrary, relatively smaller scale events are seen in non-petroleum-based companies such as cement plants and chemicals-based plants. They planned their turnaround maintenance more frequently and as such the volumes of activities are rather small that allow the events to be completed with a short duration of about 10 days. Comparatively, the level of organizational resources mobilization was relatively lower.

All systems have mechanisms for emergency management activities as a result of uncertainties. Plant turnaround maintenance is no exception. Despite careful planning of the maintenance activities, plainly, the work scope for the event is not known until the plant and equipment are shutdown, opened up, and inspected. Uncertainties are certain as it involves plant that is worn or

damaged. Chances of emergent work cannot be underestimated and at times the impact can be significant to the turnaround overall schedule and cost. In this situation, the turnaround manager has to make fast decision in securing the necessary resources to execute the emergent work. The following options are available to minimize the schedule slippages and cost overrun. The turnaround manager can increase the level of resources. Alternatively the work shift pattern can be changed from a single shift to two-shift. If permissible, the workers can work longer hours (overtime).

Generally, the lists of work to be carried out during the turnaround are generated by production, maintenance, engineering, project, safety, and quality departments. The reported typical work scope of turnaround maintenance that are performed by the companies include maintenance of facilities for statutory inspection, plant preventive maintenance, plant corrective maintenance, plant cleaning, safety and quality initiatives, and project works for plant replacement or plant improvement (Zulkipli, 2010). The lists are analyzed, challenged, and validated by the plant and turnaround maintenance team. Some of the proposed work may be dropped before the work scope is finalized. As a rule, the agreed work scope should contain only what is necessary to restore, maintain, or enhance the reliability of the plant and which cannot be done at any other time except shutdown. Safety plan, quality plan, financial budget, and other resources required for the turnaround are derived from the approved work scope. Even though the process of determining the work scope is initiated at operative level, senior management influences this process through turnaround policy and objectives.

Managing contracts

Contract management is another fundamental generic process in the turnaround maintenance organization. Company employs contractor to acquire additional capabilities that are not available internally. For example, companies enter into such contractual agreements when they require experienced maintenance personnel or specialist skills. Others may wish to delegate some of their risk exposure by sharing the work with another party. Additionally, past experiences show that contractors are more cost effective and productive. Whatever the reasons, it is essential for the company to effectively manage the contract. Managing contracts and contractors have become the important management process of turnaround maintenance as reported by large majority of refineries and petrochemical plants (Zulkipli, 2010). Apart from contractual arrangement with suppliers and vendors, companies that perform turnaround engaged many contractors to execute their turnaround. A contractor could alleviate a critical resource constraint of a company, but if the required work cannot be completed on time as required, the benefit of outsourcing the work is diminished. Instead, the company has to suffer the consequential financial lost due to duration overrun. Hence, managing contracts is essential. As observed in a natural gas processing plant, the strategy for services and materials contracts include (1) open bidding for the contract work packages, (2) using the existing price agreement as the basis for contract negotiation whenever possible, (3) using single source for propriety equipments.

The selection of contractors much depend on the work scope of the turnaround, the design of the turnaround organization, the type of contract to be awarded, and the availability of contractors. The contract work may be packaged by type of work, by work areas, or by functional unit. For

instance, a natural gas processing plant packaged the work by functional units. Altogether, there were six units that managed nearly forty work packages which were awarded to fifteen contractors. These units were responsible in selecting the contractors, commercial and technical evaluation of tenders, and seeking approval from the Senior General Manager of the plant. Upon approval, the monitoring of the contractors' performance was carried out by the plant turnaround manager and the turnaround management team.

Managing a contract involves tasks from contract creation to contract completion. The tasks of managing a contract is aimed at ensuring both parties to a contract fulfill their obligations in meeting the objectives from the contract. It would possibly be stating the obvious that adequate resources are necessary to manage contracts. In addition, contract management personnel are required to have adequate commercial awareness and technical knowledge on issues of the contracts.

There will always be some tensions between the different perspectives of the parties to a contract. Contract management is about resolving or easing such tensions to build a 'win/win' relationship. Despite good relationships problems do arise. As such, the contract must define the procedures for undertaking corrective action if, for example, target performance levels are not being achieved. If a dispute cannot be resolved at the level where it arises, it will be necessary to involve a higher level authority. This escalation process needs to be managed.

Contractors are stakeholders too, and while their motivation is primarily financial, they have many other concerns that may have a strong influence on their performance. As such, a measurement process has to be established to evaluate the performance of these contractors. It is also relevant to look at rewards to contractors for the excellent performances and the quality of services that have been delivered.

3. Conflict Management

The network of interactions and interdependence of people and tasks in the turnaround maintenance environment provides unlimited possibilities for conflict among groups and teams. The two types of conflicts often associated with turnaround organization are organizational conflict and task conflict. Organizational conflict is the struggle that arises when the goal-oriented behavior of one person or group blocks the goal-directed behavior of another person or group. Some of the sources are related to different values and belief systems, barriers or obstacles to effective communication, personality differences and cultural differences. Task conflict relates to the content and goals of the work. Some of the sources of task conflict are related to scarce resources (scarcity motivates people to compete with others for the resources to achieve their objectives), task interdependence (when team members must share common inputs to their individual tasks, need to interact in the process of performing their work or receive rewards that are partly determined by the performance of others) and incompatible goals.

Conflicts may develop between individuals or groups of individuals in the turnaround maintenance organization. Conflicts do occur between the stakeholders that include the production (client), turnaround maintenance team (agent), contractors, and vendors to name a few. Conflicts are inherent in turnaround maintenance environment. However, they have to be resolved as quickly as possible to avoid escalation. How they are managed will have significant impact to the turnaround implementation. In general, conflicts relating to operational issues of the

turnaround should be resolved at the operative levels of the organization. Senior management involvement should be infrequent. On the contrary, senior manager has to successfully manage conflicts associated with strategic and policy issues that have higher ramification in the organization.

There are various approaches to managing conflicts in the turnaround environment. These include effective communication, group dynamics, emphasizing on superordinate goals of the turnaround, formal authority, careful planning of resources and schedule, negotiation, and effective control and coordination system.

Issues on organizational resources mobilization for turnaround maintenance, the provision of funds, turnaround work scope, timing of the turnaround event, duration of the turnaround, and the total number of maintenance personnel for the event harbor the potential of organizational conflict between various functional departments in the turnaround organization. A case in point is a dispute between marketing department and maintenance department of a chemical company over the issue of timing and duration of a turnaround event. Issue on the extent of the turnaround work scope can be another ground of possible conflict between plant department and the turnaround team. It is quite common for the plant department personnel to include “second-line” maintenance work (deferred corrective work and preventive work) to the propose turnaround work list to take the opportunity of the plant shutdown. However, as the costs of turnaround work are expensive, this type of work has to be excluded from the turnaround work list. Time is the essence in turnaround maintenance execution. Hence, quick decisions in resolving conflict are crucial during the execution of the plant turnaround maintenance activities. Failure to do so risk delaying work, reducing productivity, schedule slippage, and ultimately leads to costs overrun. The traditional method of using formal authority in resolving conflicts promotes faster decisions by minimizing time-consuming negotiations to achieve consensus ([Baum and Wally, 2003](#); [Lin and Germain, 2003](#); [Child, 1985](#)).

Citing another example, a plant turnaround manager in a natural gas refining company conducts two turnaround progress meetings daily. Among others the attendees include the turnaround manager, safety officer, project manager, engineering and maintenance manager, area engineers, area coordinators, contractors, suppliers, and vendors. One of the main agenda of the meeting is resolving any organizational or task disputes. The turnaround manager plays the role of mediating and settling conflicts with the participation of other stakeholders.

4. Communication

Effective communication is crucial in plant turnaround maintenance. Large volume of information has to be effectively disseminated to relevant parties throughout the life-cycle of the turnaround to ensure the event is executed as planned and the objectives are met. Principally, every stakeholder of the turnaround should be adequately briefed on the relevant aspects of the event. Internally they include employees of the company, members of the policy team, control team, plant personnel, and support groups. External stakeholders include contractors, emergency services such as fire dept, hospital, and clinics, Department of Safety and Health (DOSH), Department of Environment (DOE), local community, local authorities, and other groups likely to be impacted by the turnaround.

Prior to the event, general briefing is delivered to all stakeholders of the turnaround event. The idea is to create a common understanding of the requirements and to solicit commitment of everybody towards the successful implementation of the event. Generally, this is done few weeks before the execution of the turnaround. For example, it is observed that in an oil refining plant, the turnaround issues, plant-based issues, engineering issues, and safety issues are commonly addressed by turnaround manager, plant manager, engineering manager, and safety officer respectively.

Effective communication is extremely vital during the execution phase of the turnaround as well. Large volumes of information are communicated in ascertaining smooth execution and control of the event. In large majority of turnaround, the form of communication include written documents such as letters, memos, reports, minutes of meetings, charts, posters, banners, electronic means such as e-mails, walkie-talkie, telephones, mobile, morning briefings, daily progress meetings, and other impromptu briefings as and when is necessary. The evidence of the importance of communication has been witnessed in a turnaround of a gas processing plant whereby more than 100 units of walkie-talkie were used. Likewise, posters, banners, charts, bunting, and notices marked the vigorous landscape of the “turnaround village”.

Efficient communication is equally essential through-out the final life-cycle of the turnaround vis-à-vis termination stage. Post-mortem debrief is carried out and all the information relating the event are organized into a report. This promotes the consolidation of large volumes of information that will be communicated to the relevant stakeholders of the turnaround for future turnaround improvement.

It is evident that without effective communication, the turnaround event can go off tangent and caused duration and cost overrun. It is one of the critical factors in determining whether the turnaround is successfully executed or otherwise.

6. Relationships with External Stakeholders

The typical external stakeholders of plant turnaround maintenance include among others shareholders of the company; customers; vendors; contractors; creditors; local, state, and federal government authorities; union; local communities; general public; institutions such as hospitals, nearby clinics, fire department, Department of Safety and Health (DOSH), and Department of Environment (DOE). Each of them has different views and interests towards the turnaround event. Some of them may facilitate the event, while few others in contrast regulate the turnaround environment.

Primarily, the importance of managing external stakeholders cannot be underestimated. The process of executing the turnaround has to meet stakeholders' expectations. Their views have to be taken into consideration. For instance, DOSH regulates the turnaround environment. The regulations and procedures governing the health and safety of the turnaround employees, and the safety aspects of the activities, processes, and plant operations are all under the purview of this department. Citing an example, an emergent work has to be carried out on a piping system. This unplanned work was found at the eleventh hour, a day before the scheduled start-up operation of the plant. Unfortunately, the work required sand-blasting to be done and this process has to be

approved by DOSH prior to execution. The possibility of duration overrun was looming. Due to good record of safety compliance and fine relationships, the turnaround engineer was able to get verbal approval from the authority to proceed with the work prior to submission of formal documentation. Consequently, the schedule overrun was averted and the start-up operation was carried out on time.

Generally, it is incumbent upon the senior management of the turnaround organization to identify the external stakeholders. Their significant interests towards the turnaround have to be recognized. It is not uncommon for the company to formally inform the purpose and schedule of the turnaround to these stakeholders. For instance, it is mandatory to send formal letter to DOSH detailing the schedule of the event. Similarly, DOE, Fire Department, nearby hospital and clinics are formally informed. The level of activities during turnaround maintenance escalates few folds as compared to the normal business operations. Despite the strict adherence to safety plan and standards, the chances of accidents cannot be discounted. Hence, it is wise to keep the relevant parties well informed of the event. Furthermore, it is pertinent that any inevitable contentious issues to be addressed promptly between the company and these stakeholders. An ongoing willingness to meet with any stakeholders to assure them that their concerns are being considered by the turnaround management is compelling.

Conclusion

Plant turnaround maintenance is a crucial asset management in the process-based industries. Well-planned and well executed plant turnaround maintenance is critical. Focusing on technical systems and techniques in achieving high performance is required but rather limited. Equal attention to the institutional and organizational dimensions is compelling. Unfortunately, studies on the organizational aspects of the plant turnaround maintenance are sparse. This paper has successfully paved the first step in closing the gap in this body of knowledge.

This paper has put forth an analytic framework for examining the core generic processes of turnaround maintenance by emphasizing on the institutional and organizational elements. This is a significant contribution to the process of understanding the social dimensions of plant turnaround maintenance that were ill-emphasized before. The framework uses the basic concepts of rules, roles, and groups and matches them with six core generic processes that take place in the turnaround maintenance organization. The generic processes identified include formation of turnaround maintenance organization, resource mobilization and management, communication, conflict management, contracts management, and relationships with external organizations.

This analytic framework can be used as tool for comparative analysis on the various forms of institutions and organizations of turnaround maintenance irrespective of the types of plant technology and industries. Similarly, the framework serves the managerial concern with creating appropriate organization that will facilitate successful implementation of the turnaround maintenance event.

Table 1: Analytic Framework: Turnaround Maintenance Activities, by Institutional and Organizational Elements

Institutional and Organizational Elements	Plant Turnaround Maintenance Core Generic Processes					
	Formation of Turnaround Maintenance Organization	Resource Mobilization and Management	Communication	Conflict Management	Contracts Management	Relationships with External Stakeholders
Key Rules	Rules in the formation of turnaround maintenance organization.	Rules for mobilizing people and other resources for planning and executing the turnaround	Rules for communicating all aspects and requirements of turnaround throughout the life cycle of the event	Rules for resolving disputes between individual s and groups and sub-units in the turnaround environment	Rules for selecting, organizing, and managing contracts for turnaround	Rules in managing external stakeholders
Important Roles	Roles for approving the turnaround organization and creating business strategy for managing the turnaround event	Roles involved in determining the work scope, organizing, mobilizing, and supervising the resources utilization	Roles involved in communicating and briefing	Roles involved in mediating disputes, making judgments, enforcing sanctions, and settling disputes	Roles involved in determining the type of contract, contractor s' selection, monitoring contractor s' performance	Roles involved in identifying, determining stakeholder s' influence, and developing strategy to manage stakeholder s
Significant Social Groups	Groups that influence the establishment of turnaround organization.	Groups that are established to plan and execute the turnaround	Internal and external stakeholders who influence and those who are likely to be impacted by the turnaround	The groups that participate in settling disputes, and enforcement of sanctions	Groups involved in managing contract creation, execution, and analysis for the purpose of maximizing	Groups that could have profound impact on the outcome of turnaround

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