A STUDY ON MAINTENANCE AND LIFETIME HEALTH MANAGEMENT OF CONSTRUCTION STRUCTURES

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ABSTRACT:

Maintenance is the process of keeping a civil engineering structure in a functional state so that it can continue to fulfil the purposes for which it was built. This is accomplished via the performance of various tasks. Maintenance and management are two aspects that are intricately connected to one another. Building management, in addition to being responsible for the fundamental characteristics of a building like its security and cleanliness, should also coordinate or even involve the execution of maintenance plans in order to provide residents with a living environment that is both safe and pleasurable. The inspection process and monitoring might be intelligently integrated for purposes of maintenance. Employing the same staff members to carry out both responsibilities would be advantageous for the owners of the business. Hazards may be created by defects, which can lead to severe or even deadly injuries. The majority of abnormalities may, at an early stage, be identified based on symptoms that are either visible or observable. In many nations, the management and maintenance of structures is a significant challenge for their owners and managers. These countries have an ageing civil infrastructure. Because of the very significant increase and disposal of such infrastructure as well as the prices that are involved with it, it is not straightforward to modify or maybe heal any of the structures. The purpose of a structure is to facilitate the fulfilment of the user's time obligations. The purpose of maintenance is to extend the average life of a structure by postponing the onset of deterioration, degradation, and failure. This is accomplished by the use of preventative measures. structure maintenance management is a complicated process that comprises planning, directing, controlling, and organising resources for the life of the structure's functional functionality. This is done in order to ensure that the building can continue to operate.

In order to manage and maintain civil infrastructure in a cost-effective manner, a balanced consideration has to be given to both the performance of the structure and the overall cost accumulated over the course of its full life cycle. The majority of the maintenance and management systems that are now in use were built solely with the goal of minimising total life-cycle costs. However, the one maintenance and management solution that was achieved in this way does not inevitably lead to good long-term performance of the structure. Another issue that has to be addressed is the fact that the performance of the structure is often defined using the visual inspection-based structural condition states. However, the real safety level of the structure has not been taken into explicit or sufficient consideration in the process of establishing the choices on maintenance management. This article provides an overview of the current developments in life-cycle maintenance and management planning for decaying civil infrastructure.

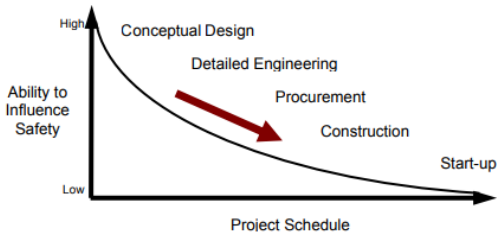
I. INTRODUCTION

Maintenance of declining structures is a big challenge for property owners and operators in all countries with aging infrastructure. Due to the inadequate level and distribution of such infrastructure and the costs associated with it, it is impossible to replace or repair all deteriorating structures. Operational management systems have had varying success in different countries. This paper describes the key features of management systems, reflects current best practice in various countries, and highlights the state of the art in this area. Case studies have proven that the incorporation of structured health monitoring into management systems is optimistic for property owners to rationalize decisions. Continuous the downsizing and rising costs of maintaining and repairing civil infrastructure systems are urging property managers / owners to make decisions in an uncertain environment. In the civil infrastructure system, considerable attention has been paid to highways and railway bridges in recent years, where the importance of transit networks around the globe is self-evident. These high asset value structures undergo a steady increase in loading frequency and intensity, and as a result of exposure to harsh environmental conditions, often decline at a higher rate than during the design stages. It is clear that UK roads alone have an annual budget of

more than $ 1 billion, which is earmarked for UK strategic highway maintenance, which accounts for 10% of the total UK road network. Due to the large scale and distribution of such infrastructure and its associated costs, it is impossible to replace or repair all declining structures in a short period of time. The Bridge Management System (BMS), used in one form or another worldwide, provides a systematic framework for repair and maintenance management. Current best practice with regard to maintenance management is to regularly evaluate the current state of the system through a comprehensive program of routine inspection, and to expand the model to assess the future status of certain structures. Structural monitoring can only be implemented in very limited cases, e.g. If a complex structure is assessed as being of poor quality, but no signs of distress are present, or verification of a relatively novel structural repair method immediately after repair.

CONSTRUCTION SAFETY – MAINTENANCE MANAGEMENT

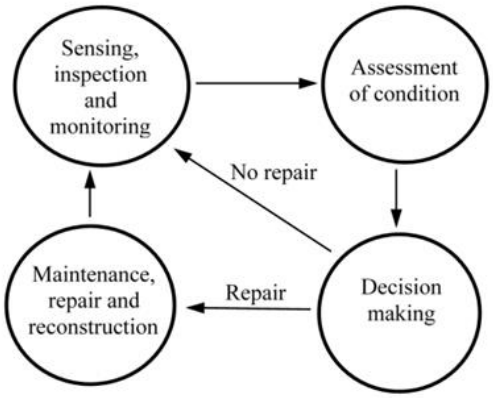
Construction management can assure project success under different delivery methods. CM is different from both design and manufacturing and is recognized as a separate profession. Through the CM model, resources from various disciplines and backgrounds intersect to provide structural leadership in the planning, design and construction phases. Due to project delivery constraints; Time, project capitalization, owner experience and the complex nature of projects can serve as a CM agent to the owner and/or consultant in the pre-design and design phases. Constructors in the CM model can greatly influence and contribute to DFCS through the flow of information as shown in the modified Figure. Project knowledge, risk assessment, design reviews, constructor input and a comprehensive management plan can provide the optimal mix of project safety designs. As will be discussed in the proposed CM model for DFCS, CM offers the best placement of safety assessment and identification in creating a successful and timely project. In studies conducted by Szymberski (1997), the time/safety influence curve was developed to demonstrate that designer influence could be an integral part of construction safety. As shown, safety can be best controlled during the early stages of the design development when the influence is high, even as the project is being conceptualized, and diminishes throughout the project life cycle. Regardless of the chosen contract form or project delivery utilized, design-bid-build (DBB), design-build (DB), or construction manager/general contractor (CM/GC) even greater influence can be achieved in the conceptual design phase through the incorporation of the experiences of construction management.



Time / Safety Influence Curve

STRUCTURAL HEALTH MONITORING AND MANAGEMENT

Structural Health Monitoring and Maintenance (SHM2) Outline of information processing and decision making, solution and construction work (Figure)



Circular flow of structural health monitoring and maintenance activities.

OBJECTIVES

- Avoiding damages caused by agencies and keeping them in good attendance and working condition
- Correcting defects in structure structures and strengthening them if necessary.
- To extent the useful life of the bridges and prevent premature capital outlay of replacement.
- Providing a safe, secure and efficient work environment to meet the needs of the lender / insurer and prevent deterioration of physical assets.
- To maximize the aesthetic and economic values of the building as well as increase the health and safety of the occupants.

• To study the management techniques and repair methods used in rehabilitation of concrete structures.
• To analyze the defects in the existing bridges as case study.
• To understand the latest repair methods and materials used for repair and rehabilitation of the structures.
• Finding ways to increase repair and durability.

II. APPROPRIATE REPORT

During World War II there was a tremendous advancement in engineering and technology, which emphasized the need for management of engineering systems. Previous management has been regarded as a skill-based functional discipline and experience-based. Does management need to change often? The growth and application of complex equipment has resulted in increased growth and demand for higher productivity.
This affects the capital used in production equipment (Weinberg & Pintelon, 2002). Systems are very expensive compared to their operation and support. In capital equipment used in processes, the rare design that leads to testing can result in failures. This has affected production, which has resulted in loss of revenue. This has reduced inflation in recent years and caused significant constraints on the company's budget. To reduce the company's budget, staff availability for undefined work has been reduced. Next is fuel costs, the largest part of any company's operating budget is maintenance costs (Hansen, 2006; Lofsten, 2000; Park & Hahn, 2001). Therefore, timely maintenance measures are necessary to reduce the incidence of failures by increasing the reliability of the equipment through effective maintenance.
It is clear from the previous discussion that the importance of industrial management is controversial, and it is now a well-established fact that maintenance tasks are needed and therefore, maintenance management has increased significantly and is still growing. The same is true of the automobile industries. The automobile industry has been under intense pressure in recent years for its survival and growth because of its unique characteristics. With increasing automation and automation in the automobile industries, the manufacturing process is becoming more sensitive to machines and the public. Consequently, the role of equipment management in the automobile industries in regulating quality and quantity; Reducing costs and achieving the high level of credibility required to meet production goals is more clear and important than ever. In order to succeed in this new environment, the automobile industry's machinery and equipment must be maintained under ideal operating conditions.
The literature also examines the different methods of maintenance management and thin management, the types of practices that are commonly practiced, and the tools and techniques available. In addition, this section also explores the available thin management factors applicable in this research. The primary sources of information on maintenance and thin management are from previous research and textbooks on the same topic. The literature review defines the limits to which research can take place.
Maintenance Maintenance management is a combination of all technical, administrative, and administrative actions to perform the required functioning over the life cycle of an object. Previously, management was regarded as a cost account, surrogates such as direct costs or trademen's headcount, and developed with performance measures to determine the total duration of forced interruptions. Fortunately, this perception is changing. Nowadays, management is acknowledged as a major contributor to the performance and profitability of business organizations. Management managers look for every opportunity to improve profitability and performance and achieve cost savings for the organization. There are two main goals for industrial management: one is the high availability of production equipment and the other is the low maintenance cost.
The main obstacle to achieving these goals is equipment failure in plants. These failures can hamper the company's operations, resulting in reduced use of human, material and equipment. Therefore, failures should be minimized or eliminated. The uninterrupted flow of activities allows a company to build trust and confidence in its customers
Maintenance helps to prevent things like machine breakdown that can disrupt effective productivity. The term 'maintenance' means keeping the equipment in working condition and increasing the availability of production systems at the cost of security and optimization. Maintenance management involves the management of tasks. To manage such equipment in an industrial environment, engineering equipment is becoming increasingly sophisticated and expensive to produce and maintain, and handling equipment in this field is challenging. Must be done. Implementing good management practices prevents system failures and leads to high productivity. Not only engineers, technicians and other employees involved in physical contact with the equipment, but also the team players should focus on achieving good management practices. Successful implementation leads to maximum efficiency utilization, product quality improvement, customer satisfaction, adequate equipment life, and other benefits. To bring about effectiveness, the

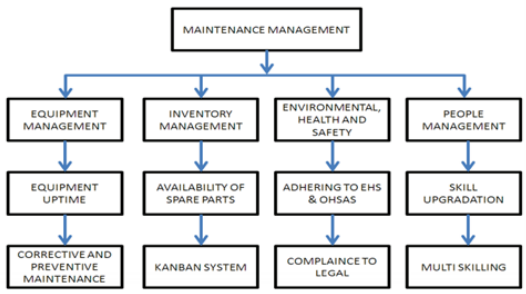
management manager must learn the critical performance measure. Measurements of productivity, quality, cost, timely delivery, safety, work-life quality, innovation and profitability are routinely used to evaluate system performance and subsystems in management.

Chen et al. (2003) proposes a state and time-dependent PM approach for the multistage Markovian deterioration system. Baloch-Mercier (2002) also proposed a PM approach with a series of testing procedures for Markov's deteriorating system. Sheu et al. (2001) consider the Bayesian theorist approach for determining the optimal PM approach with minimal repairs.

In a recent work, Zhuang and Anderson (2004) consider a Bayesian theoretical approach for determining the optimal PM approach with minimal repairs. Zhao (2003) introduced degradation ratios to indicate incomplete effects, holding that the system initiates a new failure process after PM action. PM approach is recommended for degradation systems with acceptable reliability levels. Bryce et al. (2003) showed the efficiency of the optimization method using the Monte Carlo simulation (implemented with the programming tool APLab) and the genetic algorithm to reduce the PM cost of series parallel systems based on the Beraboom importance factor and on a time basis. Badou et al. (2002) demonstrate the development of a model to reduce unit inspection time and PM cost through a special interval option.

III. METHODOLOGY

From a financial perspective, a project needs constant changes in response to the changing needs of a project management company. Staff coordination is essential in using resources to match workloads to management activities. The Work Planning Department provides procedures for developing management strategies and models to describe work flow. The control system controls the cost and plant condition. General management principles - apply planning, management, direction and control to management tasks. The management company is made up of four important and interdependent components. Typical management techniques are shown in the figure



Existing Maintenance Practices:

Maintenance process flow: The process flow study of the management function is collected through direct study of the management practices in the organization. The flow diagram is centered around the needs of the equipment and internal customers. The main goal of the management team is to maintain the equipment and make it 100% available for production.

The first step is to put the equipment through preventive maintenance. Preventive maintenance uses time

- Rules that determine when specific maintenance work must be performed to avoid unscheduled downtime. Preventive maintenance has proven that it reduces the unscheduled downtime. Preventive maintenance activities with dimmer cycles

• Planning
• Do
• Check
• The law

CONSTRUCTION PROJECT QUALITY CONTROL

The overall goal of construction quality control is to implement the laws and binding standards of the quality of a construction project, validate the construction and production aspects, and use scientific management techniques to achieve the expected work and quality standards of the project. Time Construction Quality Control, Construction Quality Control processes include Quality Control of Construction Process, Quality Control of Construction Process, Quality Control of Construction Acceptance. As a self-regulatory component of project quality, the construction side must comply with the need for a quality management system in the organization, which is achieved through specific project control. It consists mainly of the following six parts:

Project to undertake engineering research and;

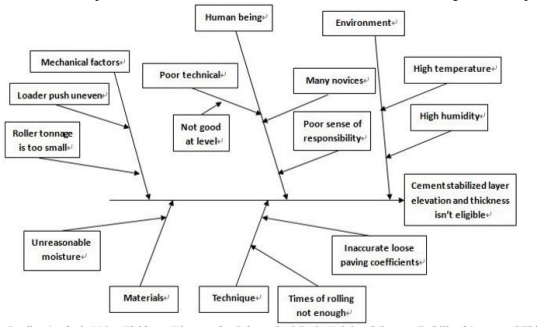
Preparations for construction include: co-testing, design of a construction company, procurement of construction electrical equipment and equipment, etc.;

Control of impact factors;

Test engineering;

Accept end acceptance;

• Quality assurance and return journey



Quality analysis using fishbone diagrams for cement stabilized layer and adequate thickness height

IV. MAINTENANCE MANAGEMENT OF STRUCTURES

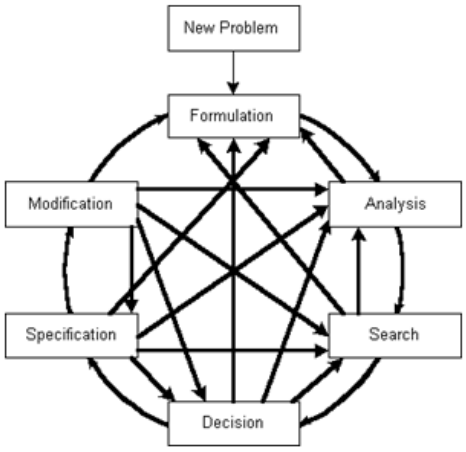
Design and architecture as an integrated system: In facilities planning, it is important to identify the close relationship between design and construction. These processes can be viewed as an integrated system. Broadly, design is the process of creating a description of a new facility, usually represented by detailed plans and specifications; Construction planning is the process of identifying the activities and resources needed to transform a design into a physical reality. Therefore, architecture means design implementation by architects and engineers. In both design and construction, many operational tasks must be performed between different functions with different priorities and other relationships. An essential aspect of design innovation is communication in design / architecture partnerships.

Innovation and Technological Feasibility

Construction project planning begins with the generation of concepts for the convenience of meeting the demands of the market and the needs of the owner. Innovative concepts in design are very valuable, not theirs For its own sake, but in a well-designed facility for their contribution in reducing costs and improving the aesthetics, comfort or convenience.

Design Methodology

Although the conceptual design process is formal or informal, it can be structured through a series of actions: formulation, analysis, innovation, decision, interpretation, and transformation. However, in the early stages of new project development, these actions are highly interactive as shown in the figure. Many iterations of redesign design are expected to improve functional requirements, design elements, and financial constraints, but the problem remains very tangible even when analytical tools are applied to the solution.



Conceptual Design Process

Structural Management System Integrated with Health Monitoring for Civil Infrastructure The innovative integration of recent advances in structural health monitoring is a very interesting and challenging research topic for the next generation of Intelligent Structure Management Systems (SMS). To develop systematic construction (infrastructure such as the SHM Highway Bridges and other necessary construction facilities of the Civil). Using advanced sensing / information technology and structural modeling / detection schemes, SHM detects, detects, and uses catastrophic natural or man-made events as well as structural damage from long-term decline due to aggressive environmental stresses and increased traffic loads. These results assist construction managers in assessing the health status of existing civilian infrastructure and, ultimately, security considerations and immediate or future applications of potential management and rehabilitation interventions for life extension. The functionality of SMS and SHM is inherently interconnected and should be considered. However, the current research and learning activities in SMS and SHM are very complex. Therefore, a unified framework is needed to reduce the gap.

BETWEEN THESE TWO RESEARCH AREAS, AND TO ENSURE A SUSTAINABLE CIVIC INFRASTRUCTURE IS IMPORTANT

• **Visual Examination** - An experienced person with detailed information about the site.

• **Overview** - finding out the faults and minor details of the building.

• **Planning** - scheduling for the entire sequence of work to be done for the project

• **Implementation** - Implementing a schedule that is ready to be completed in a timely manner with no delay.

The road bridge construction

There are major differences in construction quality and current traffic levels in road bridge construction and other structures. The development of the transportation industry is closely tied to the

status quo, and highway bridges are usually a more important part of the construction process. If there is a quality issue, this could have a very bad impact on traffic across the region and cause more serious financial losses. There is a special degree in highway bridge construction techniques. This is a target manufacturing technology.

PROJECT MANAGEMENT SYSTEM IMPROVEMENT

As there are many problems in the project Because there are so many problems with the project management system at this stage, builders cannot effectively protect the general structure of highway bridges. Therefore, from the manager and management system, there are three ways to explore and improve the project management system:

1. Maintenance efficiency. The selection of talent, scientific and rational methodology allows project management personnel to actually accompany the maintenance work and take responsibility for the maintenance of the highway bridge.
2. Proper management system. Prior to the construction of the highway and bridge, it is necessary to develop a scientific and appropriate management system in accordance with previous construction experience and national security standards in accordance with the actual state of the project, so that the maintenance work is efficient and good control and supervisory role is the quality of the highway bridge.
3. Strict control over the implementation of the operating system. After reforming the maintenance system, we must establish the right of the system to be punished harshly for the violation of the system, the maintenance system and its effect to ensure that the highway bridge structure of each process is not lost.

V CONCLUSIONS

Repair and rehabilitation of concrete structures is very challenging, now repair / rehabilitation of concrete structure is one day a new topic in India. When construction is already experiencing major structural damage / deterioration, completing repair / rehabilitation work can be a real challenge. Therefore, the latest technologies and equipment described in this paper require periodic evaluation / maintenance. It would go a long way to arrest the fall and extend the life lease for the structure.

Over time, more concrete structures will emerge for major rehabilitation. The time is approaching to conduct a construction audit of all old concrete buildings / structures constructed in the sixties and earlier. Depending on the severity of the environmental impact, restoration measures may be selected. In a country like India, we cannot spend money for building space, which is against the implementation of the green building concept. Selection and evaluation of proper repair materials and protective coating saves huge money and time by reducing the repair costs of already repaired concrete buildings / structures. To modify / improve the properties of concrete or mortar, a large number of polymers / additives have been widely used in other countries.

Furthermore, repair / rehabilitation work should be done only after the cause of the deterioration has been properly identified. Before developing a repair program, it is essential for the engineer to understand the causes of the damage and make it worse. Proper maintenance through frequent visual inspection can help us improve a lot.

Maintenance throughout the period requires building inspections to be carried out for the owners from the building installation to the occupation or occupation of the building. Both aim to provide protection for customers and building owners.

In addition, buildings fail due to a number of factors such as defective design, incorrect construction, incorrect maintenance, incorrect materials and misuse. Therefore, the building is affected and the quality of the building needs to be compensated.

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