

Psychoanalysis and Restoration of Structure

Ms. Supriya B. Shinde

Assistant Professor, Department of Civil Engineering
ABMSP's Anantrao Pawar College of Engineering & Research, Pune

Abstract: In India, RCC has been used extensively in the last 50-60 years. During this period, we have created large number of infrastructural assets in terms of buildings, bridges, sports stadium etc., which are lifeline for the civilized society. These have been created with huge investment of resources. It is, therefore, essential to maintain them in functional condition. Since, deterioration of RCC is a natural phenomenon and has started exhibiting in large number of structures; a systematic approach is needed in dealing with such problems. The Psychoanalysis of structure is a process of assessing the present behavior of structure, identifying the loads & forces acting on the structure, identifying the effects of these loads and forces and finally assessing the stability & safety of the structure to withstand for its remaining life. After Psychoanalysis of structures is carried out on regular intervals of time, it helps to identify the problems in the initial stage. After structural analysis, if the required restoration of structure is carried out regularly, it substantially reduces the overall maintenance / repair cost of the structure.

Index Terms – Psychoanalysis, Restoration.

I. INTRODUCTION

Psychoanalysis refers to the process of implementing a damage detection and characterization strategy for engineering structures. Damage is defined as changes to the material and/or geometric properties of a structural system, including changes to the boundary conditions and system connectivity, which adversely affect the system's performance. The structural health monitoring process involves the observation of a system over time using periodically sampled dynamic response measurements from an array of sensors, the extraction of damage-sensitive features from these measurements, and the statistical analysis of these features to determine the current state of system health. For long term structural health monitoring, the output of this process is periodically updated information regarding the ability of the structure to perform its intended function in light of the inevitable aging and degradation resulting from operational environments. After extreme events, such as earthquakes or blast loading, structural health monitoring is used for rapid condition screening and aims to provide, in near real time, reliable information regarding the integrity of the structure. Infrastructure inspection plays a key role in public safety in regards to both long-term damage accumulation and post extreme event scenarios. As part of the rapid developments in data-driven technologies that are transforming many fields in engineering and science, machine learning and computer vision techniques are increasingly capable of reliably diagnosing and classifying patterns in image data, which has clear applications in inspection contexts.

II. LITERATURE REVIEW

Literature review related to the structural health monitoring was carried out. The objective was to know the stability and the performance of different structural units in design. It was noticed that many researchers, engineers and consultants have worked extensively on nondestructive tests, wired sensors as well as wireless sensors but never implemented in India.

III. OBJECTIVE

- a) To promote innovative SHM solutions as an integrated part of designed and existing structures.
- b) To promote the application of SHM technologies to assure public safety and the structural safety of civil infrastructure (e.g. buildings, bridges, offshore platforms, power plants, pipelines, highways, and railways) related to various engineering disciplines (e.g. construction, materials, structural engineering, the special case of geotechnical engineering including but not limited to sliding slopes and mining area -open and in the underground – and other aspects of the field).
- c) To respond to technical and societal challenges such as those with regard to heritage sites or historical structures, structures in dense urban regions and structures used for public gatherings.

IV. NATIONAL STATUS

India is a developing nation and it is very important for the country to be enlightened and well informed about its infrastructure. India is adopting certain SHM techniques but they are very basic and their results are not very effective and can be better with new technologies like sensors based SHM, Wireless SHM, SHM software which are already being used in the case studies. Structural Health Monitoring has become a vital need of a structure so that the damages can be detected and later be retrofitted. Restoration is a technique by which resistance can be provided to the structures against the seismic actions for which they were not originally designed. India shall have an Indian Standard Code on Structural Health Monitoring and it has to be mandatory for all the upcoming and previous structures.

In India, government structure are majorly owned by state government or the agencies governed by state government. A report on dam safety procedures has revealed that on the instrumentation side, which is vital for monitoring of dam safety, there appears to be a communication gap between the officer-in-charge of design / construction and officers who take over maintenance. There are many instances where the officers in charge of maintenance are not aware of the instrumentation proposal that has gone into the dam and there exist many missing links. The initial readings of the instrument are rarely available for an instrument embedded in the dam, the absence of which has made subsequent analysis difficult.

V. IMPORTANCE OF THE PROJECT

With an advent of all new structures coming up a time when India is competing in today's competitive global market, one cannot tend to ignore that fact that India carries the burden of numerous old structures owned not only by the state but also the people. These old structures have known or unknown deficiencies and cannot be identified unless a disaster is experienced.

However, it would be too late by then as the damage would have already happened in terms of human loss. This leads to the present state of the poor affairs and needs a careful consideration to be pro-active to conduct health monitoring and providing proper solution, and then it would be up to the owner, may it be private or government to execute it in the national interest.

In India due to negligence and non availability of technology, SHM has not been taken seriously and therefore, misses its full potential. If safety standards are emphasized and followed SHM will grow to its full potential and be an integral part of structural maintenance and management. Safety is a serious issue and should be addressed properly in the future. In this proposal, Structural Health Monitoring basics are covered and need for SHM in the future Indian scenario. Also presented are experiences in some SHM work, which has been undertaken and its impact on the structure both in the United States and in India.

VI. METHODOLOGY

The Process of psychoanalysis is process similar to the pain and illness experienced by human body and how it is cured. If the body is considered like a structure. When a person has some damage or problem with his body, the unhealthy condition is detected by the nervous system and it sends signals to the brain about the issue. Person realizes that he is ill and visits a doctor in order to prevent its further development. Synonymously the sensors act as the nervous system and the acquisition system act as a brain. The structural expert is like a doctor for the structure and listens to the responses and proposes a solution/repair strategy. The important aspects are responses in the structure. Responses which can be commonly measured can be in general divided in

- Mechanical: strain, deformation, dis-placement, cracks opening, stress, load
- Physical: temperature, humidity, pore pressure
- Chemical: chloride penetration, sulphate penetration, pH, carbonation penetration, rebar oxidation, steel oxidation.

The physical diagnostic tool of SHM is the comprehensive integration of various sensing devices and auxiliary systems, including:

Sensory system

- Data acquisition system
- Data processing system
- Communication system
- Damage detection and modeling system

Monitoring is not supposed to make a diagnosis. To make a diagnosis and propose the cure it is necessary to carry out a detailed inspection and related analyses. Detection of unusual structural behaviors based on monitoring results is performed in accord with pre defined algorithms. The efficiency of monitoring depends on both the performance of the applied monitoring system and the algorithms employed.

VII. OUTCOME

- a) The integration of SHM systems into structure components that are already in the design phase of a structure to enable better evaluation of the materials behaviour as well as provide a tool for effective inspection during construction and operation.
- b) Optimize SHM methodologies for risk management, life-extension of aged structures and for rapid post-hazard assessment.
- c) Develop standard methodologies for the optimization of SHM systems including the development of intelligent data management and post-processing tools to provide key information.
- d) Develop and provide international standards and guidelines on the state-of-practice of SHM.
- e) Develop educational modules to train and involve undergraduate and graduate students, researchers, practicing engineers, managers, owners and their insurers, and government authorities in SHM methodologies and systems, including but not limited to proven safety, risk reduction and resilience.

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