

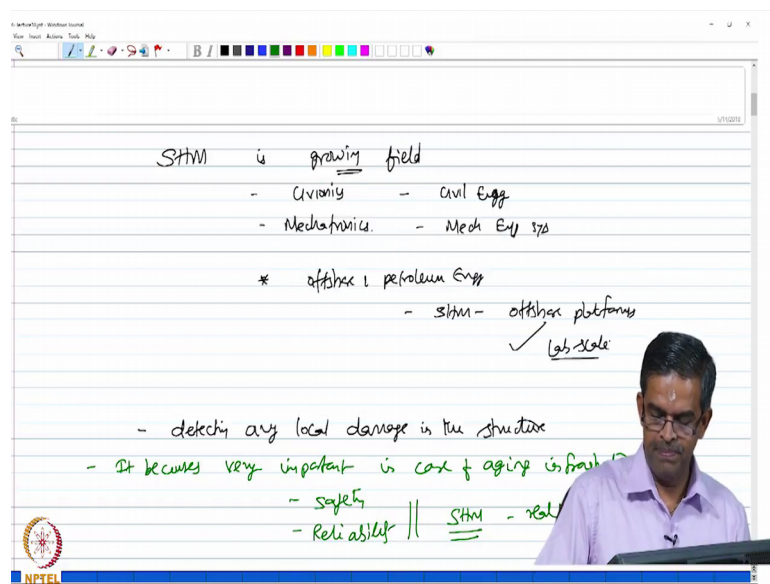
Structural Health Monitoring (SHM)
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Lecture - 83
Part - 1: Future Scope of SHM

Friends, welcome to the 10th lecture in module 4. In this lecture, we will talk about the future scope of Structural Health Monitoring. We will discuss very briefly about the futuristic aspects of SHM, what are the important areas where structural health monitoring can be very successfully deployed?

We have already seen in different lectures and set of modules what are the merits of deploying SHM for identifying the damage detection, for increasing the service life of the structure, for also improving the quality of standards of public in case of it will be buildings like infrastructure which are very important for national growth.

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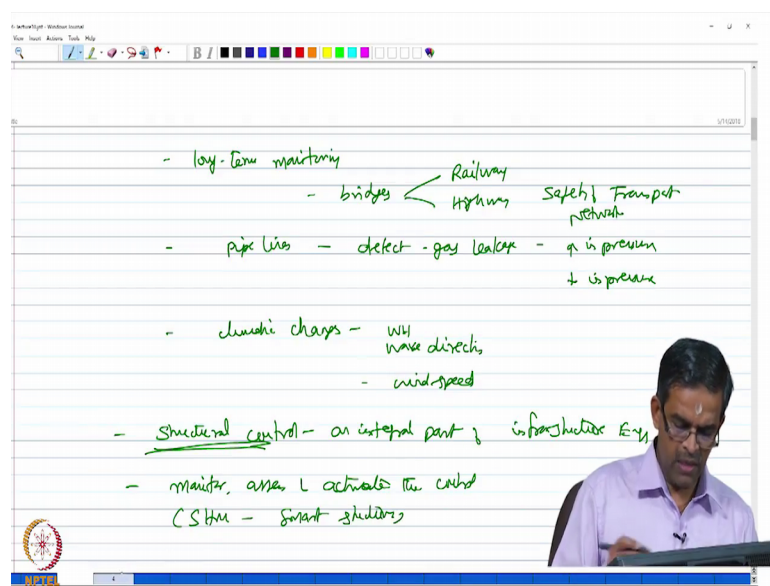


So, in this lecture we will focus about some future scope; what SHM can do all about? We already understand that structural health monitoring is definitely a growing field and gaining importance, because it has got major application in Civionics and Mechatronics that is application in civil engineering structures and mechanical engineering systems. In addition to that we also seen how they can be applied to offshore and petroleum.

We have seen how SHM can be done designed, developed, deployed for offshore platforms in lab scale. We have seen them how they can be adopted; it is a growing field which has got major application, they are useful in detecting any local damage in the structure. Now, it becomes very important in case of aging structures because safety cannot be compromised because of the compensation in age or material degradation.

So, to assess the safety and reliability of the engineering structures we generally go for health monitoring assessment on a real time basis.

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Generally, people prefer long term monitoring in case of let us say for example, bridges both railway and highway, because this can assess the safety of the transport network. We have also seen long term monitoring applications in pipelines, because they can detect any gas leakage by indicating rise in pressure or drop in pressure; both case. They can be also useful in detecting the climatic changes by measuring the wave height, wave direction, wind speed etcetera.

Now interestingly, structural control is slowly becoming an integral part of infrastructure engineering. The moment we say structural control, we need to monitor, assess and then activate the controls. So, structural health monitoring becomes an integral part of smart structures.

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Alert Monitoring System

- Disaster Management
- Damage Prediction

✓ Health Monitoring - Advanced - e ultra modern

- Very Modern & Advanced
 - use of novel type of sensors
 - adv in communication protocol
 - adv in processing/decision making using statistical tools

✗ = necessity of major infrastructures

In addition, we have also seen how the alert monitoring system can be very useful in disaster management and of course, damage prediction. But you do have to agree an important statement that health monitoring has become very modern and advanced, because of use of novel variety of sensors, advancements in communication protocol and advancements in processing and decision making using statistical tools.

So, health monitoring has become highly advanced and ultra modern; slowly it is becoming a necessity of major infrastructures that is a very important point which we want to emphasize of health monitoring.

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focus of AHM

- development smart structures

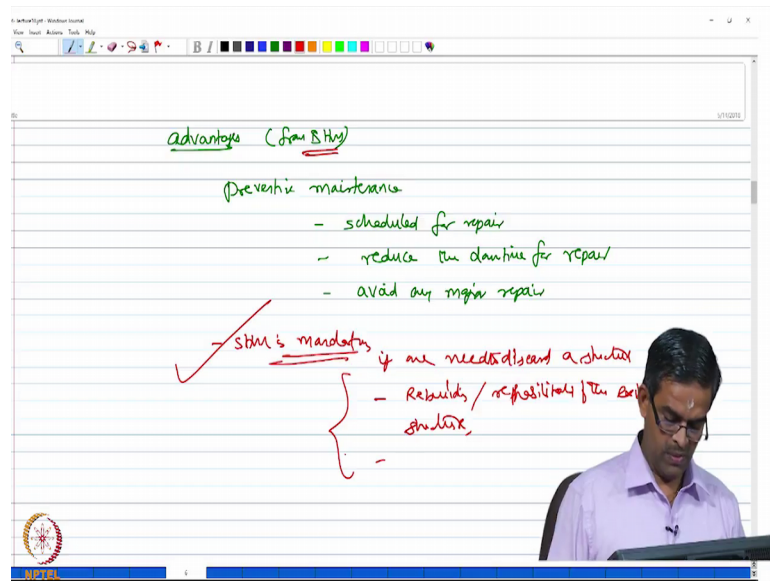
drawbacks visual inspection

- inspection methods are becoming increasingly challenging
- time-consuming
- expensive
- more complex
- Underwater structures, inaccessibility

The essential focus of health monitoring the present scenario is leading towards development of smart structures. Now, there are some drawbacks which the conventional inspection methods have; inspection methods are becoming increasingly challenging, they are time consuming, they are expensive and most importantly they become more complex.

Especially, we talk about underwater structures there is a problem of in accessibility also ok. So, they not enable health monitoring using visual inspection. In such cases one is compelled to go for health monitoring using mechanical devices which are mechatronics like sensors etcetera.

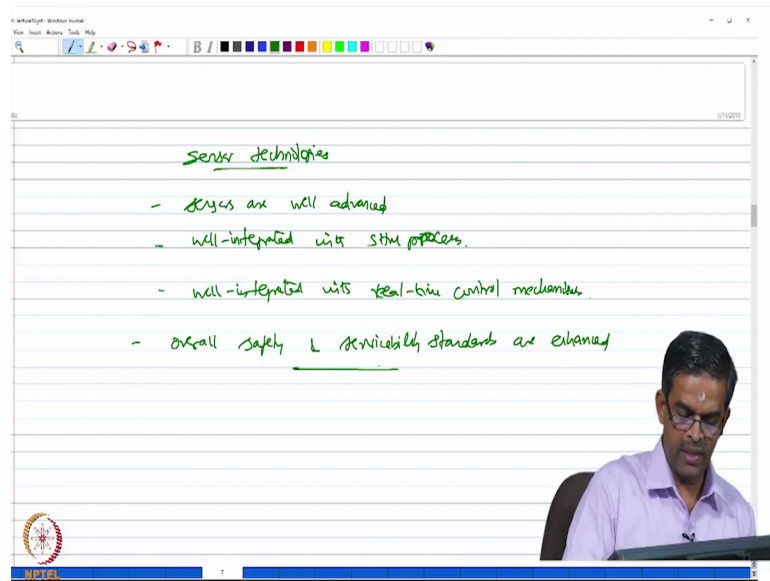
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One of the great advantage which is expected from SHM is preventive maintenance. Structural health monitoring initiates preventive maintenance which can be scheduled for repair, it can reduce the downtime for repair; one can avoid any major repair.

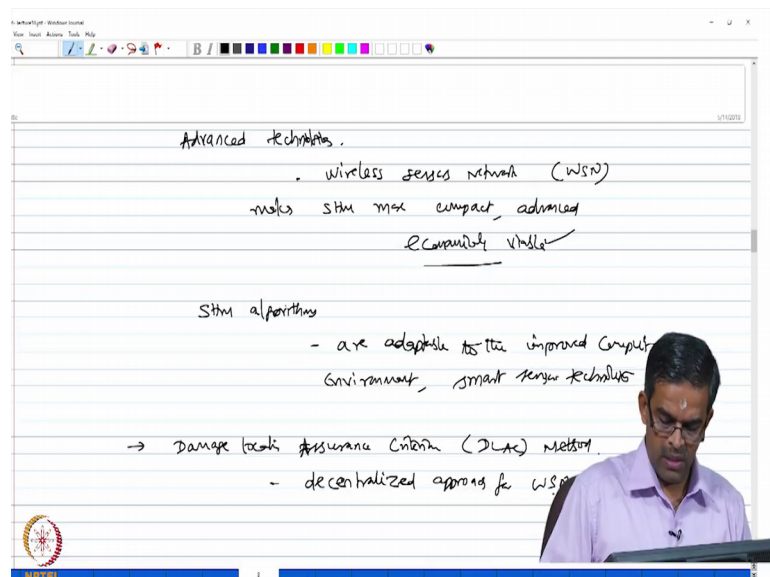
So, to be very specific SHM is mandatory if one need to discard a structure; that is if you are planning for rebuilding or rehabilitation of the structure which is existing; one need to do a health monitoring for a longer time to assess. And then come to a conclusion that the structure need to be demolished and a new structure should be constructed. So, SHM is more or less mandatory in certain issues.

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And talking about the sensor technologies; sensors are well advanced, they can be well integrated with the SHM process. They can be also well integrated with the real time control mechanisms. So, overall safety and serviceability standard or enhanced of the structure; they are enhanced using SHM.

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The advanced technologies like wireless sensors networking that is WSN makes SHM more compact advanced and I should say economically viable, because if you go for a large networking wireless sensor networking can become very cheap. We should also

mention about SHM algorithms these algorithms are adapted or let us say adaptable to the improved computing environment offered by the smart sensor technologies.

So, one of such advantage could be the damage, location, assurance criteria which we call as DLAC method, which ensures a decentralize approach for wireless sensor networking.