# Smart Overhead Crane

A virtual engineer, fully dedicated to the state-of-health of your installation: **InfraLytics®**

## Wheel health

Wheels allow the overhead crane to move throughout the hall. For those with a separate cat, an extra set of wheels allows for lateral movement of the charge over the frame. Wheels are subjected to alternating forces and sideways movement cannot be excluded as the crane moves in 2 directions, rails are not always straight, weight may vary and speed isn't always constant. This can lead to unexpected damage to the wheels. A follow-up based on temperatures and vibrations in multiple directions allows continuously tracking the wheel health.

## Rail health and mounting

These cranes move along their trajectory on a set of rails. Being subjected to loads of the bridge and the charge it carries, transferred by the main wheels, the rails are continuously under pressure. Cracks in rails and mounting issues do occur regularly. Combining position data with smart multi-axis accelerometer measurements allows one to locate and track rail issues in real-time. As such corrective actions can be taken, before operations and stability are jeopardized.

## Bearing health

In an overhead crane, bearings are found in multiple places: main wheels, and cat wheels, but also in the hoisting system. All are subjected to irregular movement, in 2 directions, and often high loads. A temperature and vibration-based follow-up of the bearings allows detecting upcoming bearing degradation before it's too late, helping to avoid failure that would lead to a long standstill.

## Rail alignment

With time, rail alignment can get distorted, either through the deformation of the support structure and/or through the lateral movement of the rails. When not perfectly straight anymore, the interaction between overhead crane and rails results in excessive lateral movement, forces on the wheels, wear on rails, and impact on guide rollers or kick rollers. Detecting deformations in an early stage by combining position data with a high-resolution inclination and/or strain measurements allows indicating deviations in an early stage and preventing excessive damage.

Scan here to receive our Newsletter

Scan this code if you have a specific question about Smart Overhead Cranes

## Cardan/coupling health

Cardans are used to transfer rotational movement between components where the relative position is not straight or cannot be maintained the same. On an overhead crane, they are often encountered between gearboxes and wheels. Though sturdy and robust, cardans are also subjected to wear and tear both from prolonged usage as well as when being exposed to excessive loads. When worn, they result in non-uniform movement of the asset and can also induce premature failure. As such continuous monitoring based on acceleration data recorded in multiple locations should be used to detect deviations in an early stage.

## Bolt tension

On an overhead crane, bolted connections are often used to connect structural parts and key components such as buffers, motors, and gearboxes. As a result of the irregular usage of the crane, bolts may come loose during operations. Continuous monitoring of bolt tension through dedicated sensors allows detecting loosening in an early stage, but also provides insights on when and why bolts come loose. As such safety risk is reduced significantly and subsequent damage is avoided.

## Structural integrity and cracks

Over its operational life, the crane gets subjected to various forces. Most come from loads being picked up, but also unintended usage or drive-train issues can lead to excessive deformations. All these add up to fatigue life being consumed. For safety reasons and/or for lifetime extension, it is essential to know the true consumption of fatigue life. This can be monitored, on-line, by equipping the structure with a set of strain gauges and implementing a continuous analysis on the data generated.
When cracks are already present, or occur regularly, an alternative approach can be followed, where crack sensors are installed on critical locations, such that the maintenance team receives a warning whenever a crack appears or starts growing.

## Motor health

Motors are essential for the main movement, trolley movement as well as the different hoists. Failure or malfunctioning is best predicted well in advance to limit the impact of unavailability on plant operations. Combining a follow-up based on vibrations, temperatures and electrical currents the state-of-health of the motors can be tracked continuously, deviations detected in an early stage and unwanted standstills prevented.

## Gearbox health

In an optimal case, gearbox degradation is detected in an early stage, such that repairs or replacements can be planned and failure can be avoided. Ideally, gearbox degradation can be minimised by limiting the situations where excessive loads are experienced. Combining a follow-up based on accelerations as well as temperatures, both on the gearbox as well as the connected motors and axles is a challenge, as the components are mounted on a structure that is constantly moving and shaking. When done properly, however, including the proper filtering approaches provides a tool for optimal health-monitoring of the gearboxes.

## Guide roller health

Guide rollers are used to make sure the overhead crane stays on the rails at all times. In cases where crane movement isn't perfectly straight or rails aren't well aligned anymore, excessive contact can be seen between guide rollers (or wheels) and rails. This results in wear of the rails as a result of the friction. But when interactions get stronger the guide roller bearings will suffer themselves, eventually leading to breakage, thus unsafe situations and standstills.

## Brake health

Brakes form an essential safety component on an overhead crane. On bridges not yet equipped with drives, they assist in braking operations during the main movement. In more recent versions, they are used to block the bridge travel movement and/or hoists when not in movement. Monitoring smooth clamping, as well as opening operations and surface wear, enables the maintenance team to have a continuous view of the integrity and quality of the braking systems on the crane.

## Hoisting system health

The hoisting system consists of a complex combination of cables, drums, bearings, motors and gearboxes. High-capacity hoists rely on very advanced components. When the hoisting system fails the bridge can no longer perform its service. As such it is important to monitor, continuously, all components of the full hoisting system. Deploying a combination of smart algorithms on acceleration, electrical current and temperature data generated in key positions in the hoisting system will lead to early detection of deviations, such that large failures can be prevented