Make sure you fly in aircraft that are tested regularly!

Aircraft, especially short haul aircraft that make the same trip many times in a day, have their cabin air pressure repeatedly compressed and decompressed before take-off and after landing, causing an expansion and contraction of the skin which is held together by rows of hundreds of rivets. These rivets can become loose and radial cracks can appear that propagate from rivet to rivet resulting in whole sections of the aircraft falling off. Regular testing of the aircraft rivets is therefore a good idea.

Similarly, it is important to regularly inspect other critical structures whose failure will result in a major disaster leading to loss of life, environmental pollution and loss of production.

These structures tend to be large and often located in dangerous environments. Examples are pressure vessels in nuclear power plants, petrochemical storage tanks, hulls of ships, wings and fuselage of aircraft, dams, bridges, and high rise buildings.

To inspect these structures, inspectors have to get access to test sites that may be located on remote vertical surfaces or in harmful radioactive, toxic or explosive environments. The preparation required to perform the inspection is time consuming and expensive. For example scaffolding is erected for buildings and ship hulls before a human operator can climb up to the test area. To inspect the floors of oil storage tanks have to be emptied and cleaned repeatedly to remove all vapour that is toxic and explosive. This can take many months.

WALL CLIMBING ROBOTS

Wall climbing robots, like Spiderman, can climb on large vertical structures.

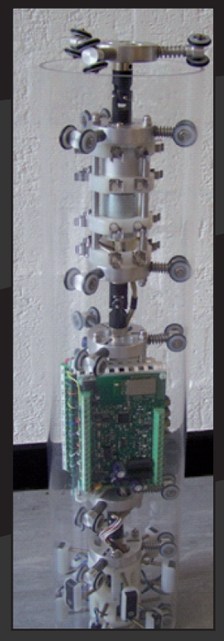
To manually inspect an area on large structures such as the hulls of ships, high rise buildings, dams, bridges, etc., you will have to erect scaffolding to get access to the area. This is expensive and time consuming.

You could abseil down to the test area on ropes but this is dangerous and not too steady.

Wall climbing robots eliminate scaffolding costs and can be sent into hazardous areas where humans cannot go.

Robot climbs walls using vacuum cups

DETECTING FAULTS IN PIPELINES



Internal pipe climbing robot

Pipelines are the most efficient way to transport liquids and gas. In Europe, more than 10 million kilometre of pipeline (mostly buried in the ground) transports oil, gas, water, and chemicals. It is important to inspect these pipelines for caved-in walls, cracks, corrosion and internal fouling.

Buried pipelines are inspected by robots (called smart pigs) travelling through horizontal pipes. Our internal pipe climbing robot is designed to also climb inside vertical pipes. This robot climbs by gripping the pipe wall.

RING climbing robot

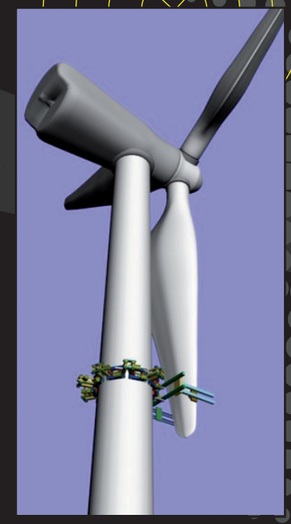
If possible, e.g. in food processing plants, robots can climb on the outside to detect internal corrosion and fouling using ultrasound. Our RING robot is designed to climb up vertical pipes, lamp posts and towers by gripping the pipe wall.

DETECTING FAULTS IN WIND TURBINE BLADES

To generate electricity from wind energy, wind turbines are increasingly being built out at sea. Their blades, made of composite materials, shatter if cracks appear due to the enormous stresses that they experience.

Blade inspection is performed by removing and bringing them to shore. This takes time and is expensive.

The RING robot is being developed to climb up 10 m tall towers to reach the blades and inspect them with X-ray computed tomography that enables 3-D visualization of blade defects.



DETECTING FAULTS IN DAMS AND BUILDINGS

How can you quickly see if a crack has appeared in a very tall dam or a high rise building?

Erect scaffolding to have a look or abseil down to have a look, or send a wall climbing robot equipped with a camera. Quicker and cheaper than scaffolding and less dangerous than abseiling!

Our VORTEX robot, like your vacuum cleaner, creates negative pressure to stick to concrete and brick surfaces. Armed with a camera, it can be also used for surveillance.