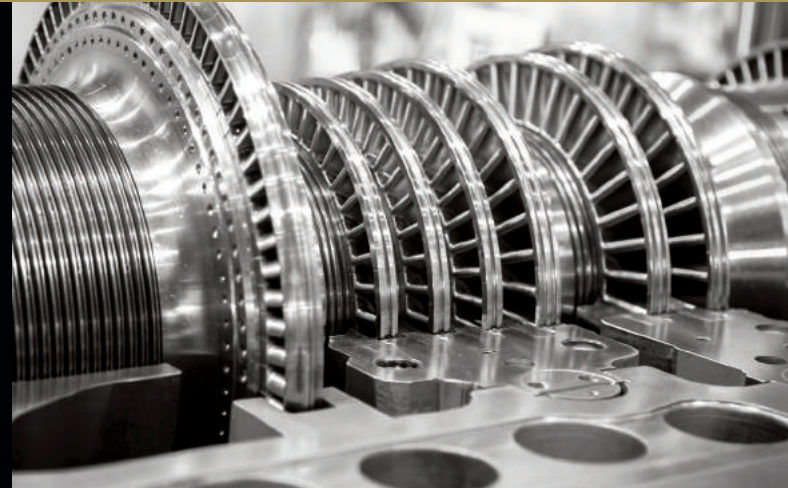


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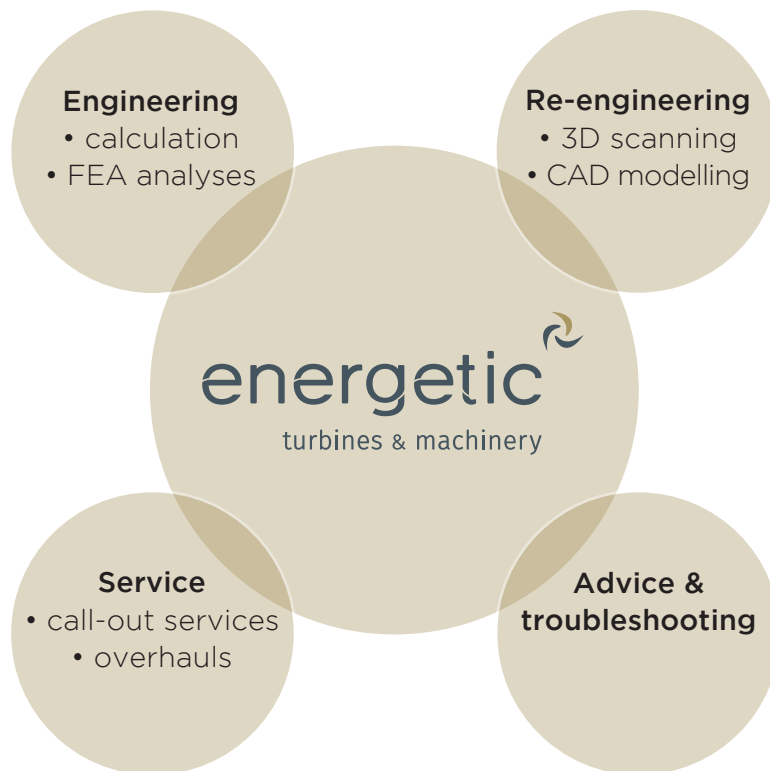
## ENGINEERED SPARE PARTS

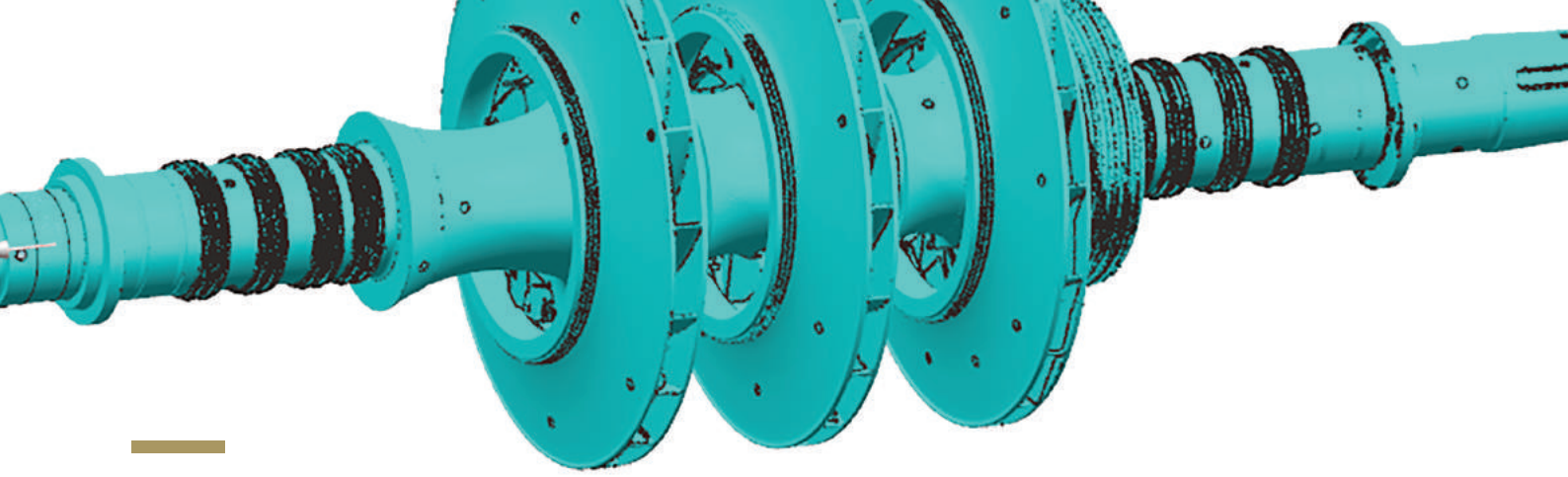
TOTAL CARE, TOTAL SERVICE, TOTAL COMMITMENT.



# INDEPENDENT SERVICE PROVIDER FOR ALL TURBO MACHINERY BRANDS

Energetic offers service and expertise of the highest quality on a wide range of turbomachinery types from many different manufacturers. Our core competence is total servicing and repair of steam and gas turbines as well as axial and radial compressors. Our aim is to unburden our customers thanks to our total package approach. A good understanding of our customers' needs is key to making a difference; and this is where we stand out. Our staff has extensive experience in power plant construction and operation, commissioning of gas and steam turbines, equipment manufacturing and engineering. Each customer and each project is unique.





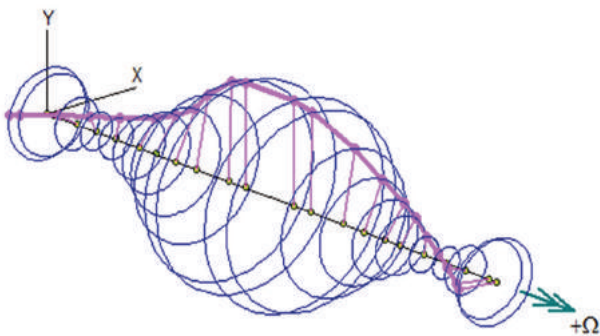
## STRATEGIC SPARE PARTS MANAGEMENT

## ENGINEERING

Each of our spare parts and full equipment designs are backed up by calculations to make sure we always meet quality requirements. We also use these calculations to improve particular designs, based on findings regarding wear and tear and deviations in shape.

We can for instance calculate the full rotor dynamics, bearing and gear load. And we might also conduct a finite element analysis in order to check the complex geometry of designs.

When the operating points of equipment change, we will simulate these in a CFD programme, allowing us to improve the design of compressors and turbines to achieve the highest performing model. We use a portable hybrid spectrometer equipped with sparking probe for metal analysis.



Rotor Dynamic Simulation of a first & second stage integral geared air compressor. Shaft rotational speed of 24000 rpm. Whirl speed (damped natural freq.) 28070 rpm. Log. Decrement: 1.6505

## WE ARE HAPPY TO SHARE OUR KNOW-HOW WITH YOU

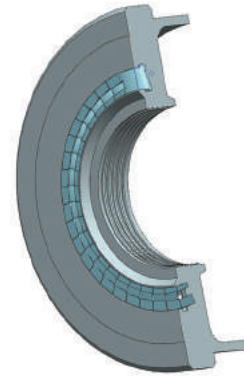
At Energetic, service, advice & troubleshooting, (re-)engineering and scanning & modelling all go hand in hand. Our technical experts and engineers are masters at both the digital and operational sides. You will receive real guidance from A to Z, with (re-)engineering and advice backed up by field expertise, and interventions and spare part deliveries deployed using digital technology.



# PARTS PRODUCTION

The finished CAD models are sent to production, where they can be manufactured immediately and almost fully automatically, so we can guarantee very short delivery times.

Once the parts are ready, they are subjected to rigorous quality control in accordance with our internal ISO9001 certification; we scan the new parts and compare the images to the design, which allows us to quickly and efficiently detect any possible faults and quality issues.



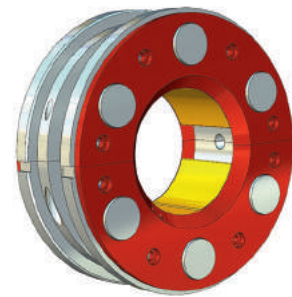
Engineering and manufacturing of steam inlet nozzle, Esher Wyss turbine 1966

## IT JUST WORKS BETTER WITH RE-ENGINEERED SPARE PARTS

Re-engineering your spare parts means you kill two birds with one stone: on the one hand, parts are optimised, resulting in better performing turbo equipment that requires less maintenance; re-engineering significantly prolongs the life cycle of your (older) installations, ensuring your operations can run as they should for longer; and you no longer depend on servicing by your machine manufacturer.

Re-engineering spare parts also results in saving on your stock, since these parts can be delivered in no time at all, at a very small cost. Moreover, you will be able to swap physical storage space for digital storage of our scans and models, combined with raw materials.

Our strong point is our in-depth expertise in turbo machinery equipment. We know everything about what tolerance, margins, dimensions and level of finish are required to guarantee optimal performance of your installation. The re-engineering we carry out is not just based on dimensioning and scanning results, but also mainly on our know-how.



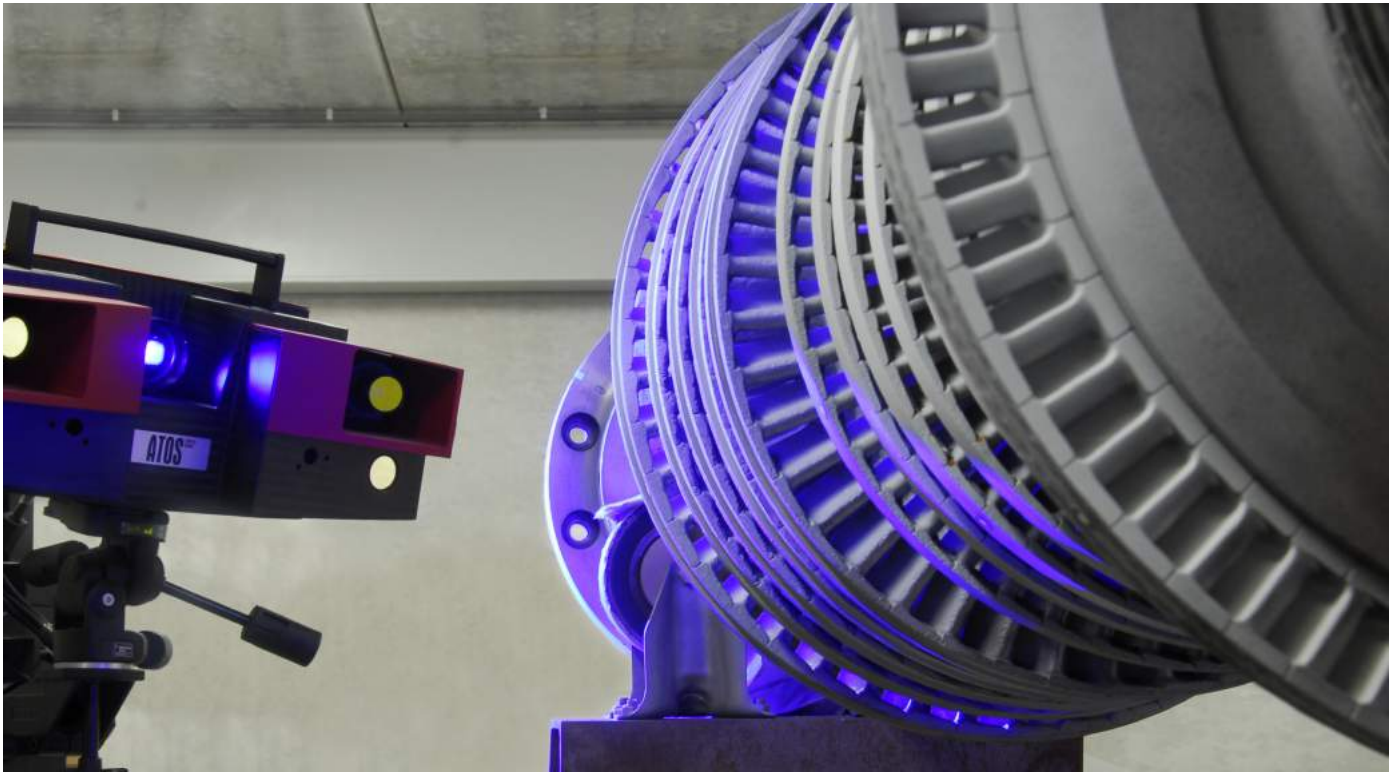
Improving stability by changing offset of tilting pads, using load calculation programme for re-designing.



Re-engineered pinion of geared turbine, solving problem of thrust fixating after troubleshooting.

## IT KEEPS ON WORKING WITH RE-ENGINEERED SPARE PARTS

You are looking to keep your older turbines, compressors and other strategic turbo machinery operational, while at the same time your original OEM no longer offers any support, or the servicing cost and spare parts are exorbitant? In both cases, re-engineering is worth considering. We will bring your installation fully up-to-date, whilst also making sure you have all necessary spare parts; at a very attractive price.



## SCANNING AND MODELLING

By combining optical measurement technology and scanning with 3D CMM (Coordinate Measurement Machines) we can generate exceedingly accurate high-resolution 3D images. This procedure can take place either in our workshop or on your premises.

The choice of technology depends on the required level of accuracy and tolerance. Blue light scanning for instance offers best results for tolerance margins between 0.01 and 0.005 mm, while for larger objects (such as complete compressors or steam turbines) we normally opt for photogrammetry.

In general, we will carry out the scans during service activities to avoid any unnecessary shutdowns. We then use the resulting data to define the complete or partial geometry of the object in a scatter cloud or polygonised mesh. The next step consists of defining the mathematical shape or creating a so-called NURBS model, which is subsequently turned into a full model using NX Siemens CAD software. This is also the phase where all wear and tear is eliminated and our experienced engineers define all required dimensioning and tolerances.





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