

The Engine Builder then handed the engine back to the Chief Engineer



## TOLERANCES ACHIEVED

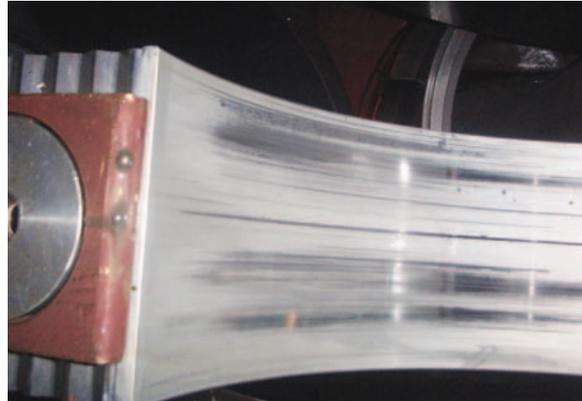
The crankshaft was straightened to 0.03mm.  
The ovality and taper of the reground crankpins was a maximum of 0.03mm  
The parallelism of the reground crankpins was held to 0.05mm  
The hardness of the reground crankpins was restored to 250 Hardness Brinell  
All heat cracks were removed

## TIMING

ABC technicians were able to mobilize and travel half way round the world to arrive on board vessel within 3 days of order confirmation. Inspection and complete testing and calibration took 1 day.  
Work was carry out on a 24 hours basis.  
Grinding of each unit crankpin including fillet regrind and superfinishing took 3 and a half days.  
Superfinishing of each main journal took us 4 hours

## IN ATTENDANCE

Technical Director from Shipping Company.  
After Sales Service Manager from Nippon Kokan SEMT Pielstick.  
Class Surveyor from Classification Society.  
Regional Manager of The Salvage Association.  
Engineering Consultants on behalf of Insurance Company, Charterer and Cargo owner.  
3 grinding technicians from ABC Grinding Inc



**Quality Repairs ... Great Savings...  
Good prices!!!**



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**ABC GRINDING CANADA INC.**

**Another "insitu" crankshaft repair...  
on time and on budget...**

## **PIELSTICK PC4V 14 CYLINDERS INSITU CRANKSHAFT REGRIND**

The damaged engine was on a cape sized bulk-er. This engine was built at Tsurumi Works by Nippon Kokan SEMT Pielstick in March 1982. After more than 22 years of continuous duty, the cam wear of this crankshaft caused an over heating of one crankpin bearing which resulted in deep scratches and heat damaged areas on the crankpin surfaces.



The first task was to determine the extent of the damage to the crankpins and to the main journals. We calibrated and tested the following :

- Maximum and minimum diameters, taper and wear of each crankpin and main journal.
- Connecting rod bores, for dimensions and wear.
- The run out of each main journal to check for bents in the crankshaft.
- Extent of cam wear in each of the crankpin.
- Complete non destructive testing using magnetic particles and ultra-violet lamp for heat cracks both on the surface and the sub surface of the crankpins and main journals.
- Comprehensive testing and profiling of hard spots and bands on the damaged crankpin.
- Conditions of the existing bearings



At conclusion of our tests we decided :

Crankpin # 6 must be ground 3mm undersize to remove hard spots and heat cracks.

All other crankpins must be ground 1mm undersize to remove the ridges from the cam wear.

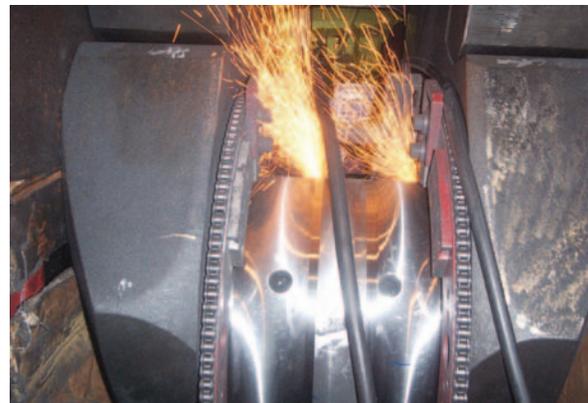
All main journals must be polished to remove surface scratches.

The crankshaft was bent in way of main journals # 6 and 7 and has to be straightened.

These findings were very useful as they provided the basis for which we could determined the time period required for the entire repair. Knowing this the Technical Superintendent could and did schedule other maintenance that was carried out at the same time. In addition this information allowed the Engine Builder, who was supervising the repairs, to correctly identify the spares well ahead of time, that would be required for eventual assembly and re-commissioning of the engine.

The crankshaft had suffered a heat induced bent in way of main journals # 6 and #7. The solution lies in stress relieve and this was achieved by using a peening hammer on the heat affected areas of crankpin # 6. At completion of this stage of the repairs, the run-out of the crankshaft was restored to 0.03mm which was exactly at Builder's Specifications.

All the crankpins were ground to the specification sizes. Work was carried out on 24 hours basis using 2 grinding turbines to speed up the repairs.



While grinding was in progress, the cylinder liners were honed in place.

In house quality control system requires that these grinding repairs were monitored on a daily basis with the following checks:

All micrometers were calibrated using "Standard" bars.

Magnetic Particle Inspection tools were used to check on presence and conditions of heat cracks.



Hardness testing using hand held portable electronic testers to determine the degree of existing hardness and the sizes of affected areas.

The fillets adjacent to the bearing landing surfaces were ground to achieve a smooth transition to the webs and as well to provide a good oil flow.

Finally all the crankpins were polished with an oscillating superfinishing machine to obtain a finish of 6 micro-inch.

All the main journals were polished to the same degree.

After careful cleaning the engine was rebuild using new bearings. The engine was tested and bearings were opened to determine the contact and wear pattern.