THIS ARTICLE

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Cranfield Tests [redacted]

[redacted] is marketed expressly with the intention of reducing intersurface friction by bonding a layer of low friction material directly between rubbing contacts, the lubricant acting merely as a carrier for the material. The material employed is polytetrafluoroethylene (PTFE), which in addition to having the lowest coefficient of any polymeric plastic so far produced, is both chemically inert and capable of operating at high temperatures without thermal degredation.

The publicity wielded by the technical media, learned institutions, consumer organisations and government bodies, controls today, to an overwhelming degree, the acceptance or rejection of a product in the open market-place. This is especially true in Europe, where a well informed public views with stark conservatism, any claims made for a product or process unless supported by thorough technical substantiation.

Since the application of the [redacted] treatment does not necessitate any complex surface modifications or component pre-treatment (as does the case of certain solid lubricants) the potential for the efficient utilisation of this product would appear to be great. It is therefore, of cardinal importance that a thorough scientific examination, in depth, be carried out, to establish, on a realistic technical bedrock, the performance of the [redacted] process in direct comparison with conventional tribological practices.

The Cranfield Institute of Technology, Cranfield, Bedfordshire, England are perhaps the foremost authority on tribology (the study of friction) in Europe, perhaps in the world. They have conducted research for some very important clients, including NATO.

Mr Brian Reason, Reader in Tribology, of the Tribology Department was asked to "prove" that [redacted] actually coated metal surfaces and improved the life of the metal by doing so. Cranfield elected to test bearing systems. They felt that they could more easily monitor specific bearing tests, plus it opened up the options by allowing them to test different metals, one against the other.

Cranfield then proceeded to design 3 different rigs to conduct these tests: (1) The Gas Council Rig (2) Michell Pad Thrust Bearing Rig, and (3) the Cranfield Pin and Disc Machine. Having three rigs permitted them to verify results from one test to another. With the exception of Cast Iron (nobody understands why [redacted] didn't improve Cast Iron in these specific tests) [redacted] performed magnificently and in several cases, astoundingly.

The tests logically bring us to two important conclusions: (1) [redacted] dramatically extends the life of the metal as compared to ordinary oil, and (2) [redacted] coats the metal surfaces, since part of the tests were run "dry" and since the treated "dry" metal outperformed the untreated "dry" metal.

The Gas Council Test Rig

The test rig consists of twelve modules supported on gas bearing units. These units carry small journal bearings (both solid and porous) and enable a wide variety of both bearing materials and lubricating fluids to be evaluated.

Four materials were tested, namely Brass, Cast Iron, Phosphor Bronze and Steel with both hardened and non-hardened steel shafts.

Bearings were lubricated for 24 hours with 20% [redacted] added to the oil and then allowed to run for a maximum of 600 hours with no further lubrication. Similarly bearings were also lubricated for 24 hours without [redacted] and again, allowed a maximum of 600 hours running with no further lubrication. 'Failure' was taken to be a seizure of the bearing shaft assembly or persistently high noise level. Friction torque and bearing termperature at the journal/shaft interface were monitored and recorded.

[redacted] performed well on Phosphor Bronze bearings and similarly on Steel and Brass. The general trend of the results was for the untreated bearings to fail while the treated bearings ran the maximum 600 hours without

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failure. The logical conclusion to be drawn is that [redacted] coated the metal surfaces since the treated "dry" metal outperformed the untreated "dry" metal.

Modified 'Cranfield' Pin and Disc Machine

There is a large range of industrial situations where machine surfaces operate under sliding/rubbing conditions, with wide attendant problems.

Examples are machine tool slideways where stick/slip motion produces poor finish in machine components. Hydraulic equipment where pistons, spool valves and actuators stick or jam causing loss of friction and Diesel engine injector wear (this latter problem will escalate when new alcohol fuels are introduced).

The 'Cranfield' Pin and Disc machine has been modified to simulate these sliding conditions.

A range of materials were used for both the rotating circular plate and the bearing pads proper. The general trend of results followed those obtained from the journal bearing tests in the "Gas Council Rig".

High Load Industrial Michell Pad Thrust Bearing

This work involves the application of a large hydrostatic thrust bearing rig (capacity of over 70 tons thrust load) to a Michell Pad Thrust Bearing provided by the Glacier Metal Co. (one of the U.K.'s largest manufacturers of white-metal bearings). Bearings of this type are used extensively by industry over a wide range of sizes (typical applications: Vertical Water Turbines used in Power Stations, Marine Propeller bearings for Super Tankers, Warships and Merchant Ships, Industrial Pumps and Mixing Equipment).

Costly bearings are often heavily loaded and operate with rubbing metallic contact causing high power loss and costly wear.

Again the system lubricated with [redacted] in oil lasted longer before seizure than normal oil. There was an improvement of between 80% and 60%.

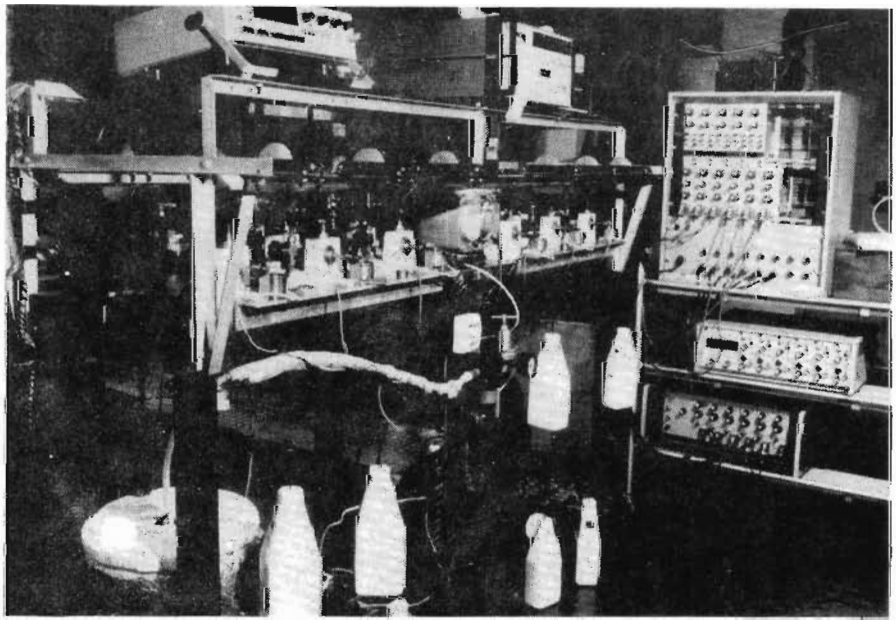
The Cranfield Report, the result of 5 years testing and study, now adds its voice to the previous test mass compiled from several countries during the last 10 years. The message is clear. [redacted] works!

Copies of the Cranfield Report are available by phoning or writing to [redacted]

From.....

The Cranfield Report

CRANFIELD BEARING RIG TESTS



Gas Council Test Rig

CRANFIELD BEARING RIG TESTS

Bearings from Gas Council Test Rig

Gas Council Test Rig

Results

Four materials were tested, namely Brass, Cast Iron, Phosphor Bronze and Steel with both hardened and non-hardened steel shafts. Figures 1 - 4 have been selected (from many) as being typical traces, and show results for these materials on non-hardened shafts. Each figure contains two graphs, the top being an example for the material specified in the bottom left hand corner with test dates specified in the bottom right hand corner. The graph shows bearings that were lubricated for twenty-four hours ('with' [redacted]) and then allowed to run for a maximum of six hundred hours with no further lubrication. The bottom graph, is a bearing lubricated for 24 hours ('without' [redacted]) and, again, allowed a maximum of 600 hours running. 'Failure' was taken to be a seizure of the bearing shaft assembly or persisently high noise level. Trace A represents the friction torque of the bearing recorded by the friction torque transducers. Trace B is the bearing temperature measured by thermocouple at the journal/shaft interface. Trace D shows the bearing temperature above the measured laboratory temperature and this 'normalised' temperature indicates the true bearing temperature without the influence of laboratory fluctuations.

HOW TO READ THE GRAPHS

A: This is the torque reading. The scale is in the left hand margin.

B: This is the surface temperature of the metal.

C: This is room temperature. The scale is on the right hand margin.

D: This is the difference between the room temperature and the surface temperature.

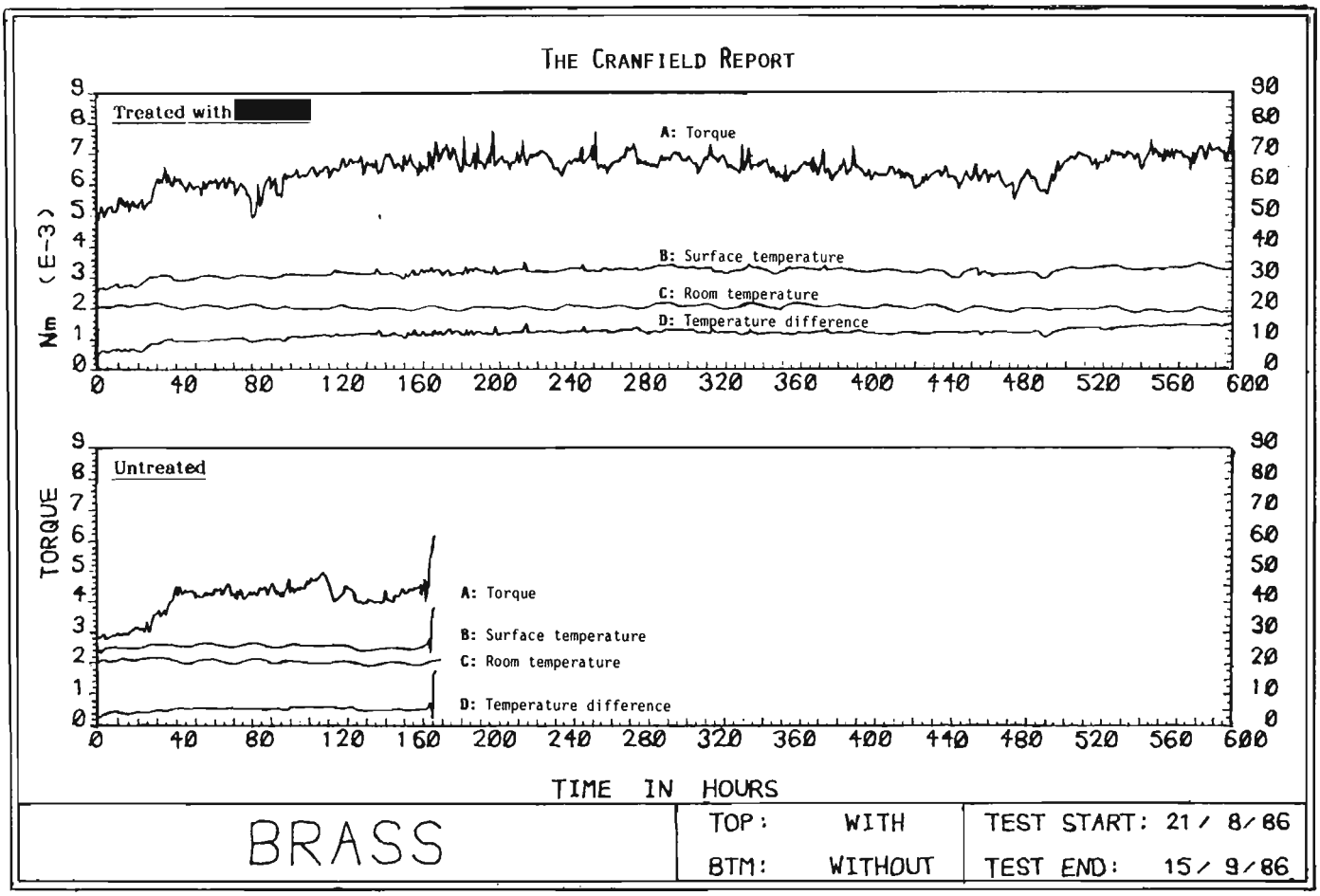


FIGURE 1

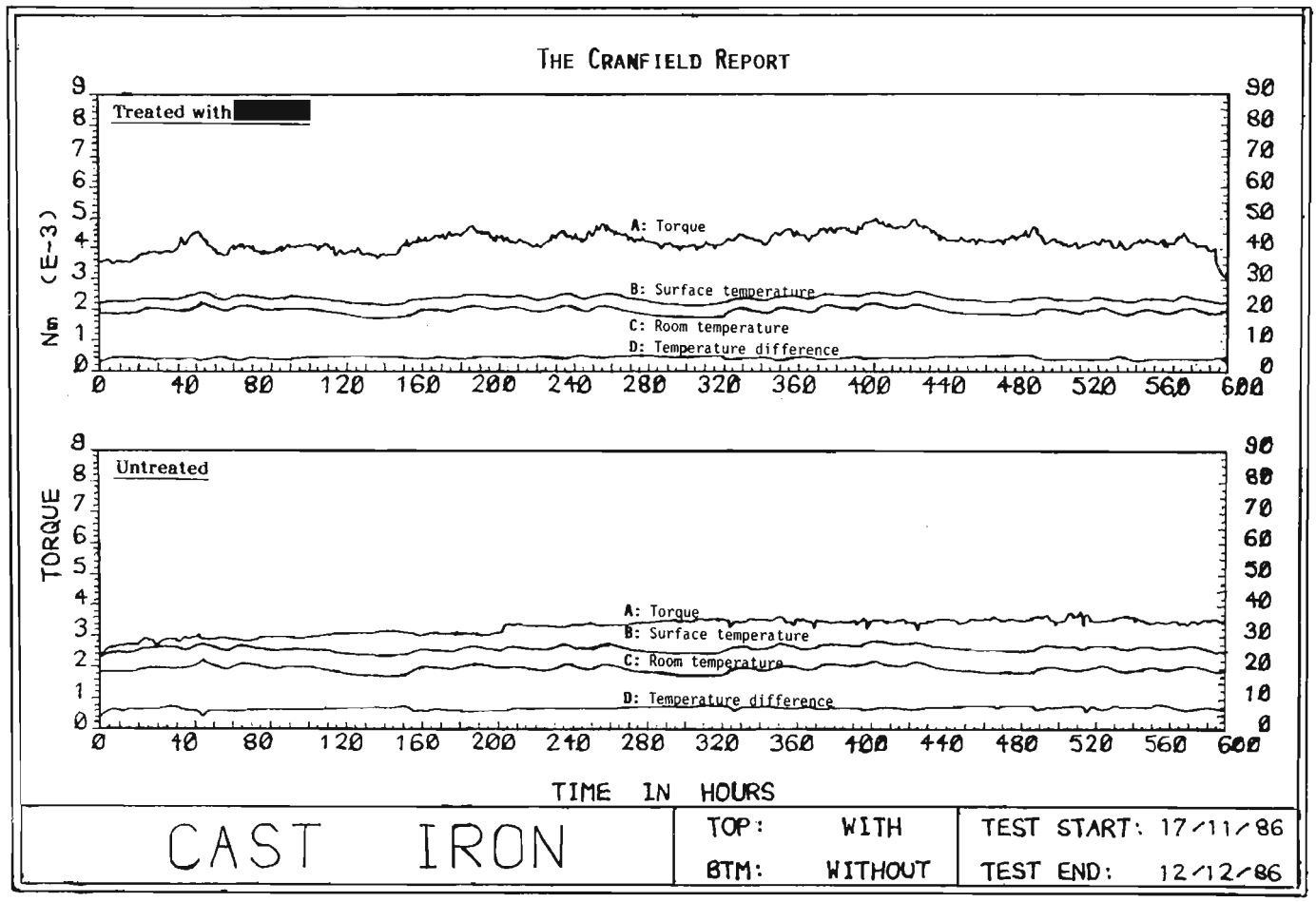


FIGURE 2

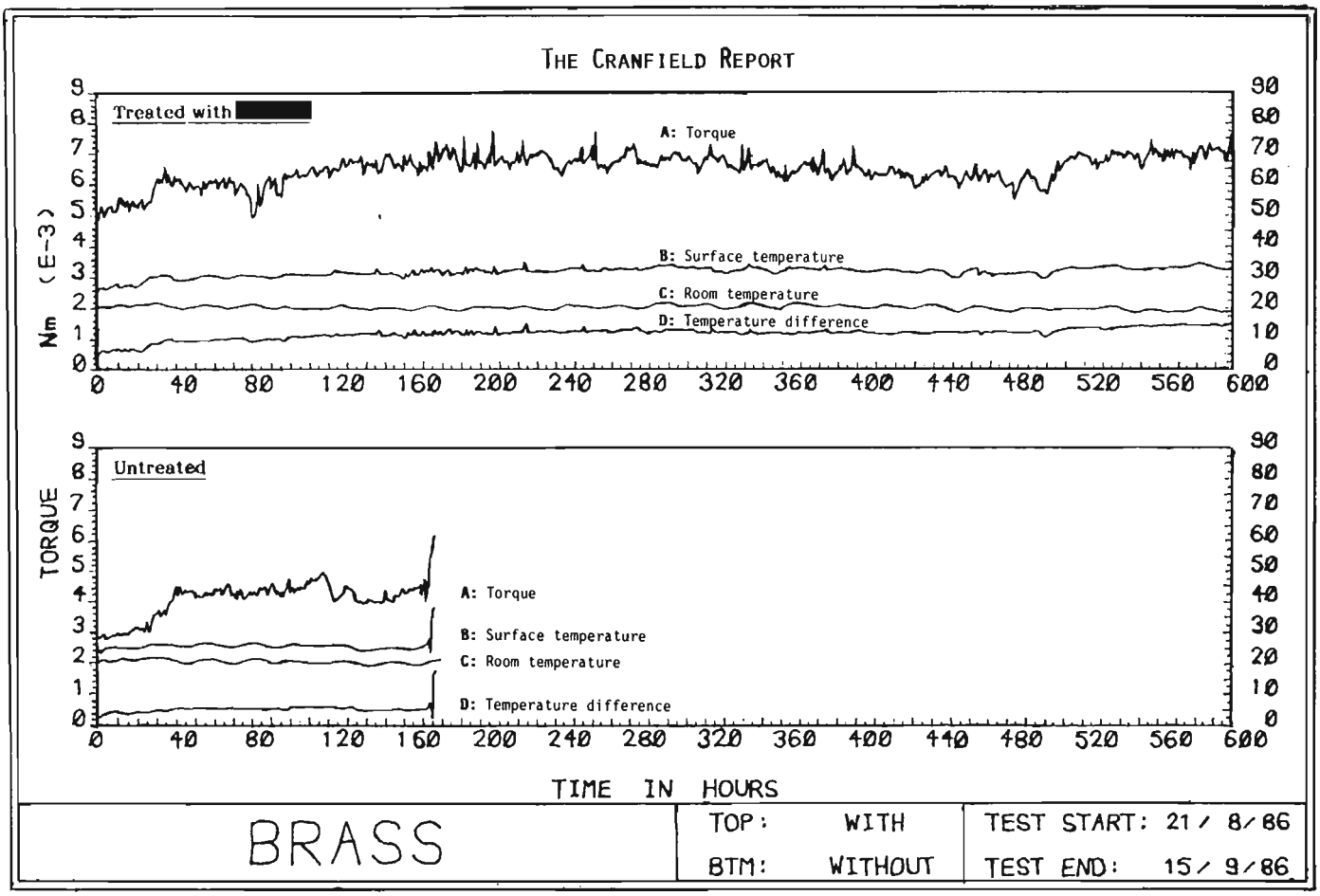


FIGURE 1

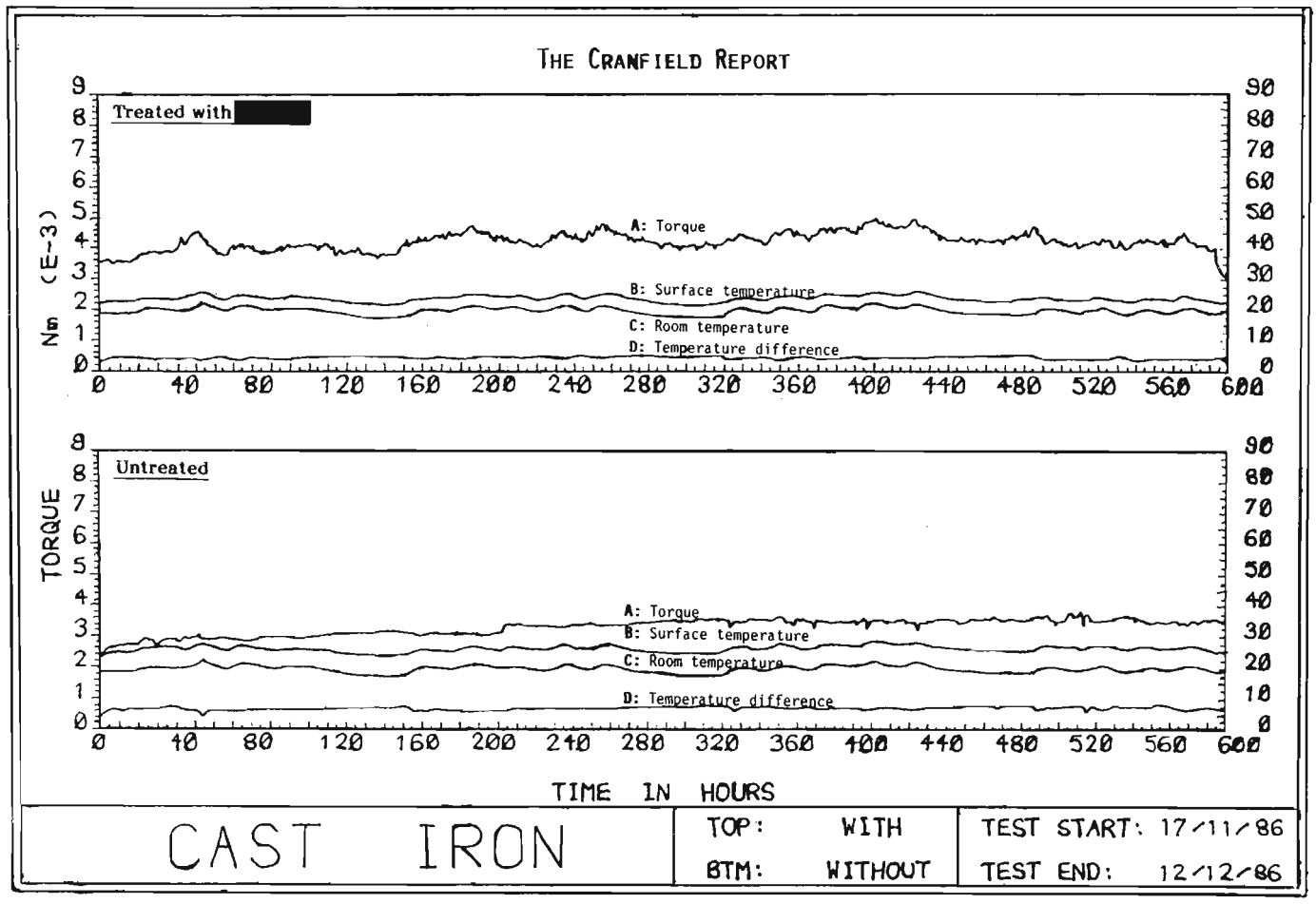
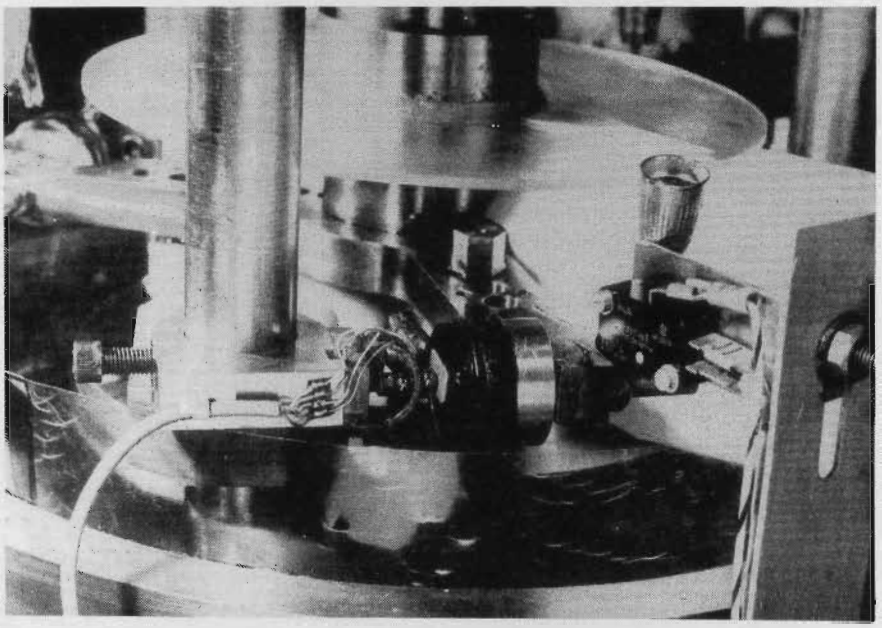


FIGURE 2

CRANFIELD BEARING RIG TESTS

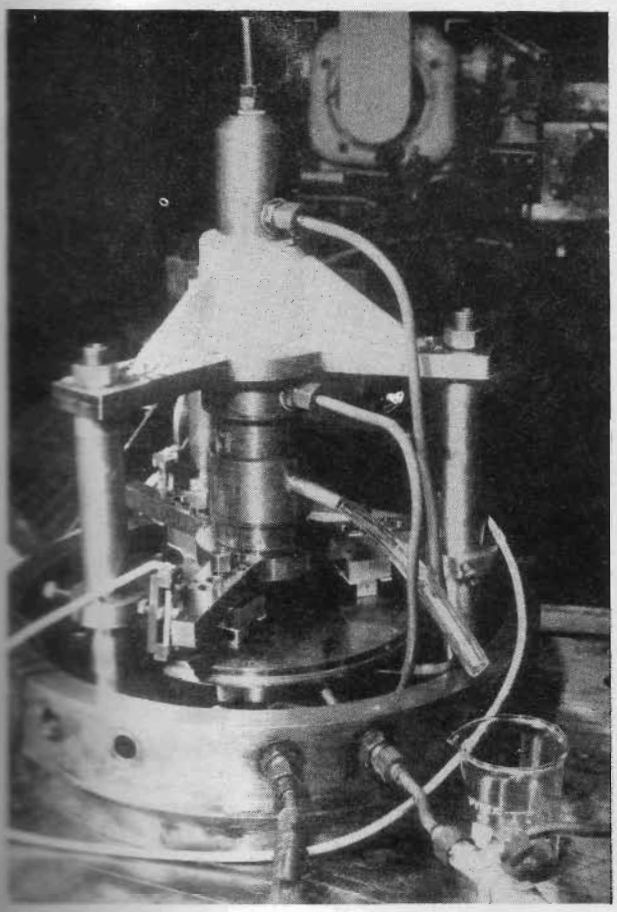
Modified 'Cranfield' Pin and Disc Machine



Results

The general trend of results followed those obtained from the journal bearing tests in the 'Gas Council Rig'. It is to be noted, however, that specific pressures were considerably higher for the 'Michell' bearing than the journal bearings.

High Load Industrial Michell Pad Thrust Bearing



Summary

Again the system lubricated with [redacted] in oil lasted longer before seizure than normal oil. There was an improvement of between 80 and 60%.