MORLEY BARLOK®
PINNED COPPER BAR ROTORS

ATB MORLEY
Technology in Motion

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Pinned Copper Bar Rotors

Morley Electric Motors Ltd, established in 1897, manufacture a wide range of electrical machines that have been specifically designed for the more arduous duties and applications. Morley's business has developed on its design expertise and experience in this area.

The revolutionary development of Barlok® rotors into Morley motors stems from designs used in the mining industry. Rotors are solidly constructed and very robust. Cores are produced from laminated, insulated, high grade, low loss silicon steel and butt up against a shaft shoulder at the non-drive end. The drive end is secured by a locking washer and locking nut and rotors are keyed with a full-length key. On high-speed motors they are also shrunk onto the shaft.

The company does not supply ordinary mass produced motors but high specification machines that are specifically engineered by working with customers to match the requirements of the driven equipment and drive train.

In order to meet the requirements of the most demanding applications - in particular high inertia loads with very long acceleration times such as ball mills, coal pulverising mills and large fans, and loads with very high starting frequency requirements such as crane travel or hoist duties and coal mining plow drives the company needed an exceptional rotor design concept.

The solution would need to overcome the obstacles that cause more conventional rotors to fail, such as:-

- The substantial electro-magnetic forces that induce bar vibration during every start, which, if left undamped could lead to a low stress – high cycle fatigue of the rotor bar.
- The non-uniform thermal expansion of the cage that can cause bar arching and binding in the slots causing thermal stress.
- Centrifugal forces acting on the end-rings and bar extensions.
- Inbuilt non-uniform joint stresses resulting from uncontrolled brazing operations.

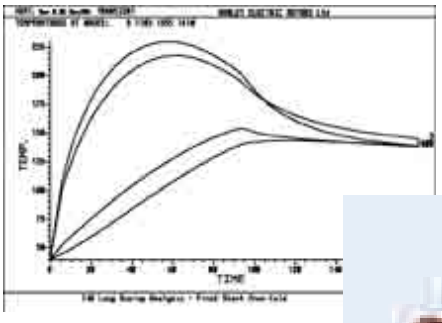
Unfortunately, the above mechanisms do not act in isolation but in combination resulting in complex stress patterns that are constantly changing.

The Barlok® concept used in conjunction with finite element software overcomes these problems by adjusting bar clearances to allow freedom for thermal expansion, whilst also pinning the bars with sprung, rolled steel pins to effectively damp electro magnetic vibration.

The system therefore succeeds because it;

- ☑ Completely eliminates radial vibration
- ☑ Dynamic bar clearance control permits freedom of movement allowing bars to expand and contract without restriction
- ☑ Eliminates non-uniform joint stresses by using a "one-shot" semi-automatic brazing process
- ☑ Uses only copper or copper alloy construction. Materials and bar shapes are carefully selected to meet individual drive requirements

Barlok® was introduced into Morley designs in 1980 and following investment in tooling and manufacturing processes, cost targets were achieved and the system was introduced as a standard feature. Since then the company has produced approximately 300 machines per annum with Barlok® rotors for use on some of the most critical and demanding applications in industry. The Barlok® rotor dramatically increases the reliability of motors used in the most demanding applications.

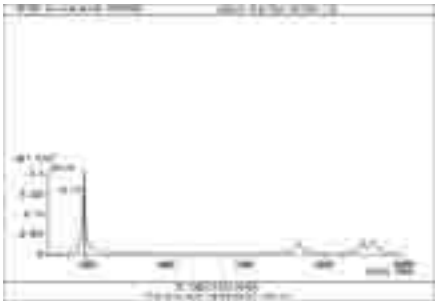


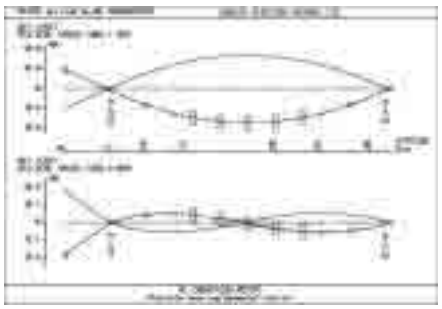
The concept has proven to be highly successful and supremely reliable. There has not been a single recorded rotor bar failure in any application or environment and many users now specify Barlok® to ensure peace of mind.

The company can demonstrate comprehensive reference lists detailing numerous high profile global installations and customers include packagers, original equipment manufacturers and end users.

The company makes use of proven mechanical and electrical design software and modern design tools including computer-aided drawing. Morley also possess the in house expertise to fully model the dynamic response of rotors using finite element analysis software. By accurately calculating natural frequencies and critical speeds of major components, vibration during run up and at rated speed can be confidently predicted to be within acceptable limits.

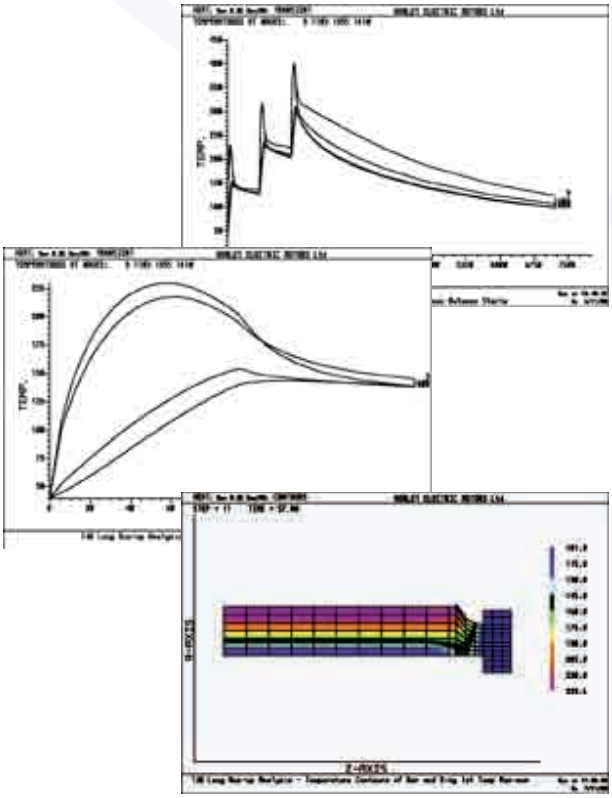
Advanced thermal analysis allows detailed prediction of rotor bar and cage temperatures under normal and abnormal operating conditions. Heat contour plots are able to describe temperature distribution in the rotor cage during critical operating conditions such as the acceleration of high inertia loads.





In addition significant node temperature time plots can confirm acceptable peaks in mid-bar least significant region (higher temperatures) and the braze critical region (lower temperature). Plots can also accurately predict critical component temperatures following repetitive starting of high inertia loads under a variety of different operating conditions.

The combination of proven, accurate electrical design software and the ability to predict dynamic response and thermal characteristics ensures that nothing is left to chance and offers the customer reassurance that motors will perform under the specified operating conditions in service.



If you want performance and proven reliability that exceeds your expectations, increased availability and therefore higher productivity, longer product life and peace of mind, then take control by installing a Morley motor with a Barlok® pinned copper bar rotor.

Morley Electric Motors

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