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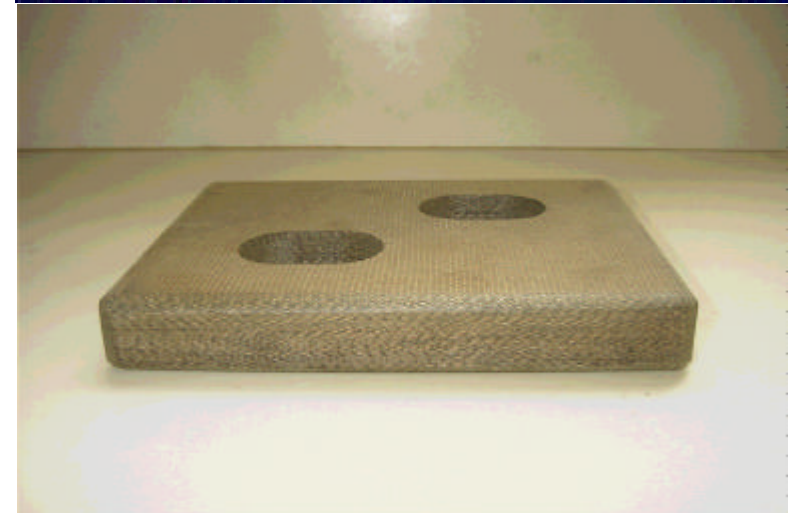
Tank Support Pads



Bitumen Tankers

Asphalt Tankers

Sulphur Tankers



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Tank Support Pads



Feroform F3637 has been developed by TENMAT to offer shipowners, design engineers and shipbuilders a unique wear resistant material capable of supporting hot tanks up to a max temperature of 300°C.

Feroform F3637 is manufactured from a unique, high temperature resistant cloth and a thermosetting resin that includes special lubricants. The material is then subjected to temperature and pressure to form a sheet material, from which the support pads are machined.

The Feroform F3637 pads are typically square in shape but the best shape for each application can be made. The thickness of the pads is determined by the temperature of the tank they are to support. Installation is simple. The pads are bonded on to the tank support strut using a chocking compound and bolted, to provide further anchoring strength (See Drawing 1). The hot tank can then sit directly onto the pads without the need for H-Beam supports underneath the tank.

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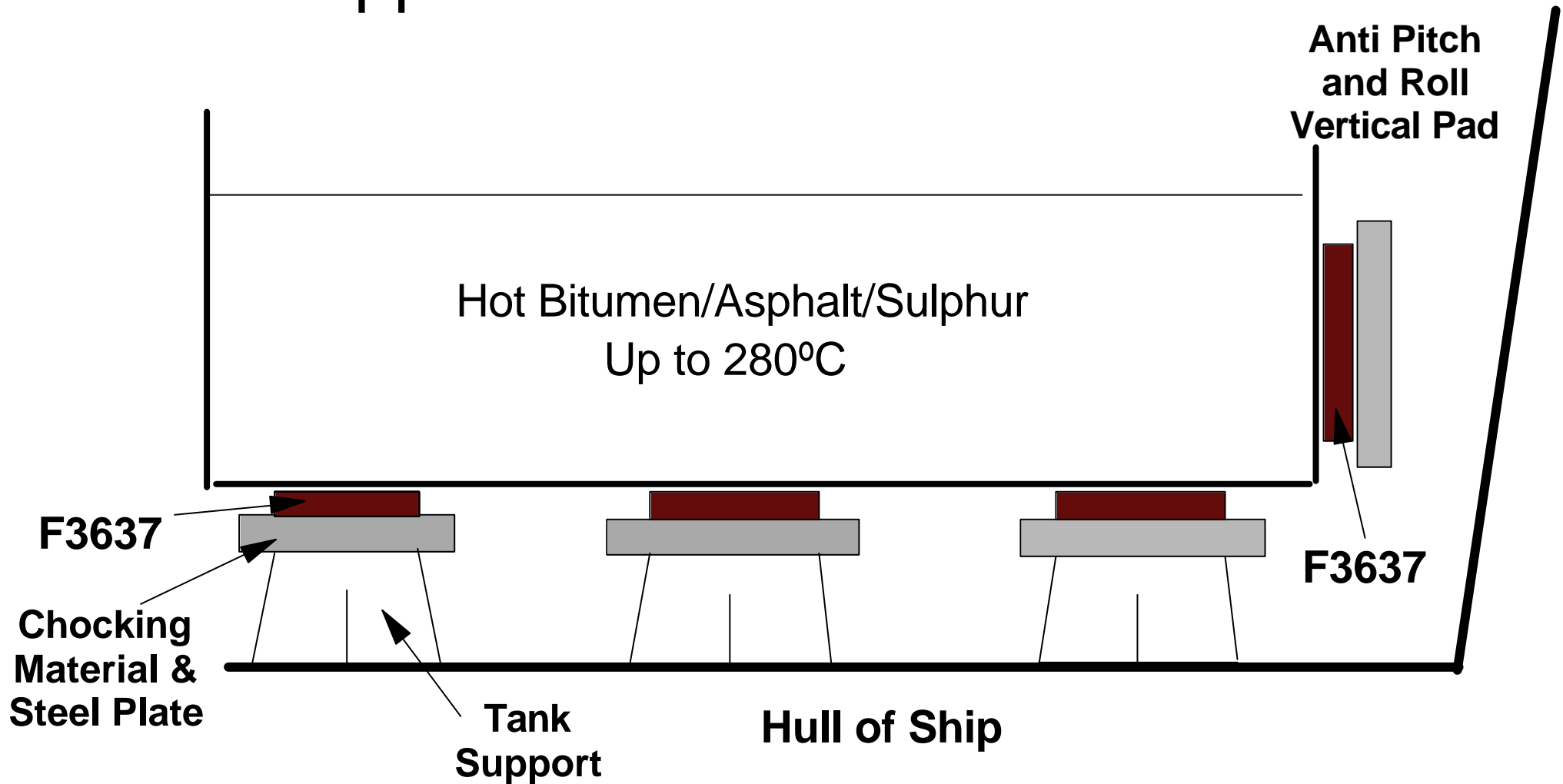
The number of tank supports and pads can be calculated by Tenmat's technical design team to optimise the performance of the pads and keep costs to a minimum. Compared to other systems, far fewer supports and smaller sized pads are required to provide sufficient support for the tanks. This is due to the high load carrying capability of Feroform F3637.

Vertical anti roll/pitch pads are also required to control movement of the tank from its fixed point (See Drawing 2). These either support the tank sides at the corners or against the H-Beams below the tank (See Drawing 3). The size and number of these pads will be determined by the size and temperature of the tank.

A simplified layout of the complete system can be seen on the next page. Once installed, the pads provide maintenance free performance which TENMAT has references for going back twelve years , without complaint.

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General Layout of Feroform F3637 Tank Support Pads

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Advantages

High Temperature Insulation - Feroform F3637 can support tanks up to 300°C and provides insulation for the support strut reducing the temperature from the tank to the support by up to 200°C. Keeping the hull temperature below 85°C allows conventional steel to be used for the structure. Because of the superior insulation properties of Feroform F3637 the cost of heating the cargo is reduced (less heat loss), and it is possible for the tank to sit directly onto the pads without the need for any H-Beams between the tank and the pad.. This saves costs and time and makes the whole system easier to install.

High Load Capability - Feroform F3637 is a high load carrying insulating/bearing material. The benefit of this is that the number of support struts, and hence steelwork can be significantly reduced compared to other systems. This again reduces costs and time for the shipowner.

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Reduced Heat Loss - Not only is Feroform F3637 an excellent insulation material, but because the number of supports and pads is reduced compared to other systems, then the numbers of points of heat loss is greatly reduced too. This in turn will provide dramatic cost savings in maintaining the temperature of the tank when in operation.

High Temperature Performance - Feroform F3637 maintains its performance characteristics up to 300°C, which is significantly higher than competitor products

Low Friction - Because of the special lubricants added into the resin, Feroform F3637 pads offer a superior surface for the tanks to move across when fully loaded. The low COF will allow controlled movement of the tank across all of the pads thereby distributing the load evenly and reducing stress on the tank.

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Elasticity and Resilience - Feroform F3637 is not only a very strong material but also has a degree of elasticity that will allow the pad to compress slightly and absorb increased loads caused by pitching and rolling of the vessel.

Inert Material - Feroform F3637 is an exceptionally inert material to temperature, water and the majority of chemicals. This results in a very stable support pad that will provide excellent life and service.

Proven Product - With numerous installations over twelve years, Feroform F3637 has proven to be the ideal solution for hot tank support systems, enabling shipowners to reduce costs, simplify the installation procedure and reduce the number of supports required.

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Custom Installation Design - Tenmat can provide technical design and advice for the installation of the Feroform F3637 pads suitable for the needs of the shipyard. Each pad system will be designed to the requirements for the type of vessel, the size and type of tanks and the product to be carried.

Approvals - The Feroform F3637 system has been given full type approval by BV and on a ship by ship basis by Lloyds, ABS, BV, DNV and GL. Tenmat is also hoping to be awarded full type approval by GL in the near future.

Quality Assurance - Tenmat manufactures Feroform F3637 pads under the ISO9002 Quality Assurance System guaranteeing a product of the highest standards and performance.

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References

| Owner | Vessel | Dwt | Product | Temp | Yr Fitted | Class | Yard | Country |
|----------------------|--------------|--------|---------|-------|-----------|--------|----------------|-----------|
| ADNATCO | Janana | 9,365 | Sulphur | 150°C | 1993 | Lloyds | Singmarine | Singapore |
| Jebsens | Sharpnes | 28,030 | Bitumen | 250°C | 1995 | Lloyds | HDW | Germany |
| Safmarine | Recife | | Bitumen | 250°C | 1995 | ABS | Hyundai Mipo | Korea |
| Polish Steamship | Penelope | 15,329 | Sulphur | 250°C | 1995 | DNV | Remontowa | Poland |
| PZ Shipping Pte | P.M Alpha | | Bitumen | 250°C | 1996 | DNV | President M | Singapore |
| Asphalt Carriers Pte | Sotec Estel | | Bitumen | 250°C | 1996 | NKK | Southern Ocean | Singapore |
| Polish Steamship | Kaliope | | Sulphur | 250°C | 1997 | Lloyds | Remontowa | Poland |
| Gearbulk | Tem Arrow | 42,400 | Bitumen | 250°C | 1997 | DNV | Hyundia HI | Korea |
| Mitrope Navigation | Mitrope | 15,500 | Sulphur | 150°C | 1998 | Lloyds | Szczecin | Poland |
| Shell NZ/Mobil | Kakariki | 46,700 | Bitumen | 250°C | 1998 | Lloyds | Szczecin | Poland |
| Shell SA | Hamrisa | 45,000 | Bitumen | 250°C | 1998 | Lloyds | Szczecin | Poland |
| Gearbulk | Hawk Arrow | 42,400 | Bitumen | 250°C | 1999 | DNV | Hyundai Mipo | Korea |
| Gearbulk | Osprey Arrow | 42,400 | Bitumen | 250°C | 1999 | DNV | Hyundai Mipo | Korea |
| PCS Phosphate | Aurora | 21.500 | Sulphur | 150°C | 2000 | ABS | ENCV | Portugal |

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References Cont

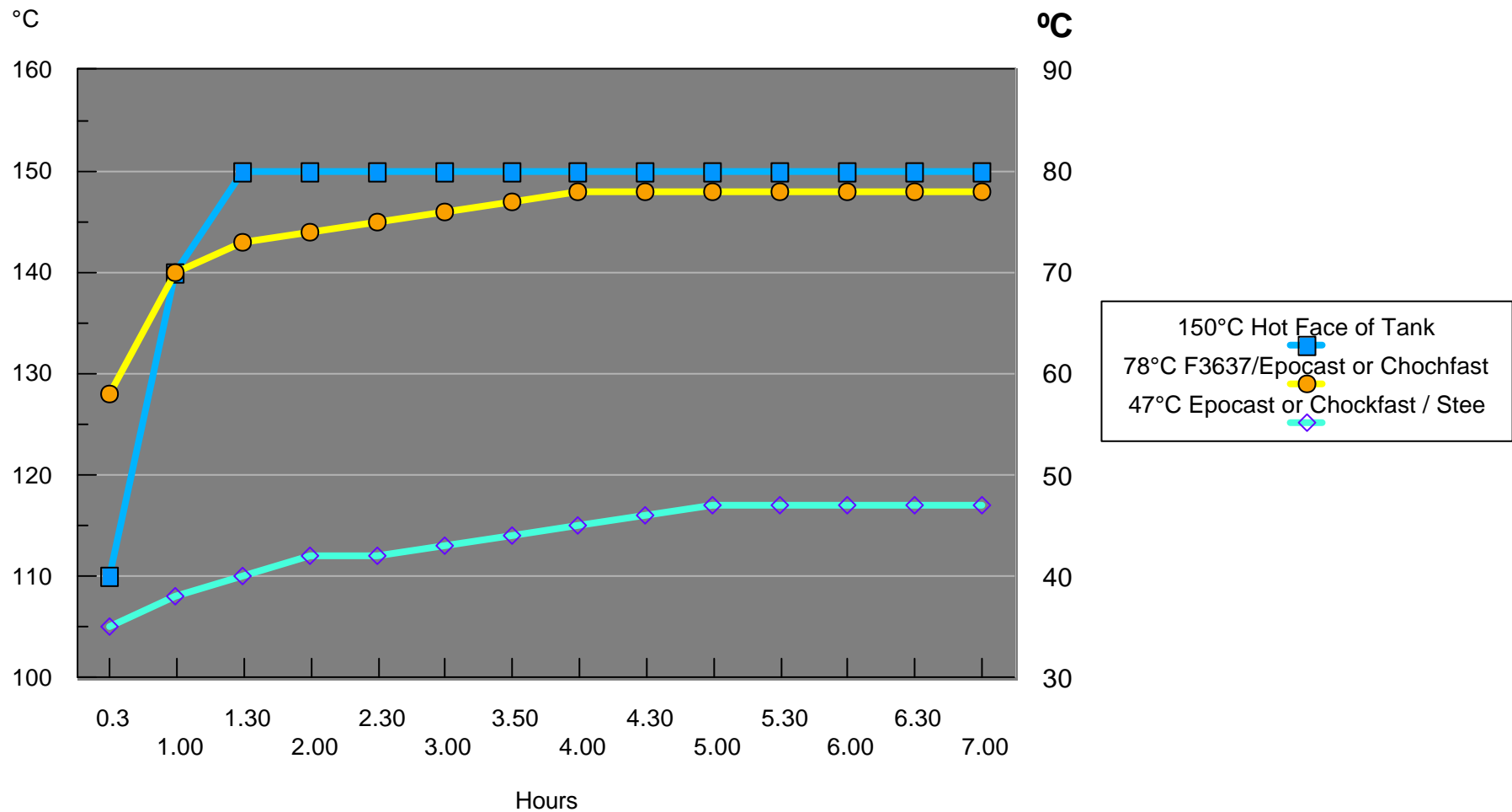
| Owner | Vessel | Dwt | Product | Temp | Yr Fitted | Class | Yard | Country |
|-----------------|----------|--------|---------|-------|-----------|-------|------------|----------|
| Sargeant Marine | Hull 531 | 9,240 | Asphalt | 250°C | 2003 | BV | Kraljevica | Croatia |
| Enea Management | Hull 701 | 4,999 | Bitumen | 250°C | 2003 | GL | Rousse | Bulgaria |
| Enea Management | Hull 702 | 4,999 | Bitumen | 250°C | 2004 | GL | Rousse | Bulgaria |
| Sargeant Marine | Hull 532 | 9,240 | Asphalt | 250°C | 2004 | BV | Kraljevica | Croatia |
| Sargeant Marine | Hull 533 | 9,240 | Asphalt | 250°C | 2005 | BV | Kraljevica | Croatia |
| Sargeant Marine | Hull 534 | 9,240 | Asphalt | 250°C | 2005 | BV | Kraljevica | Croatia |
| Jebsen KG | Hull 398 | 15,000 | Asphalt | 250°C | 2005 | DNV | Kanrei | Japan |

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Insulation Performance of F3637 with Liquid Sulphur Tank @ 150°C

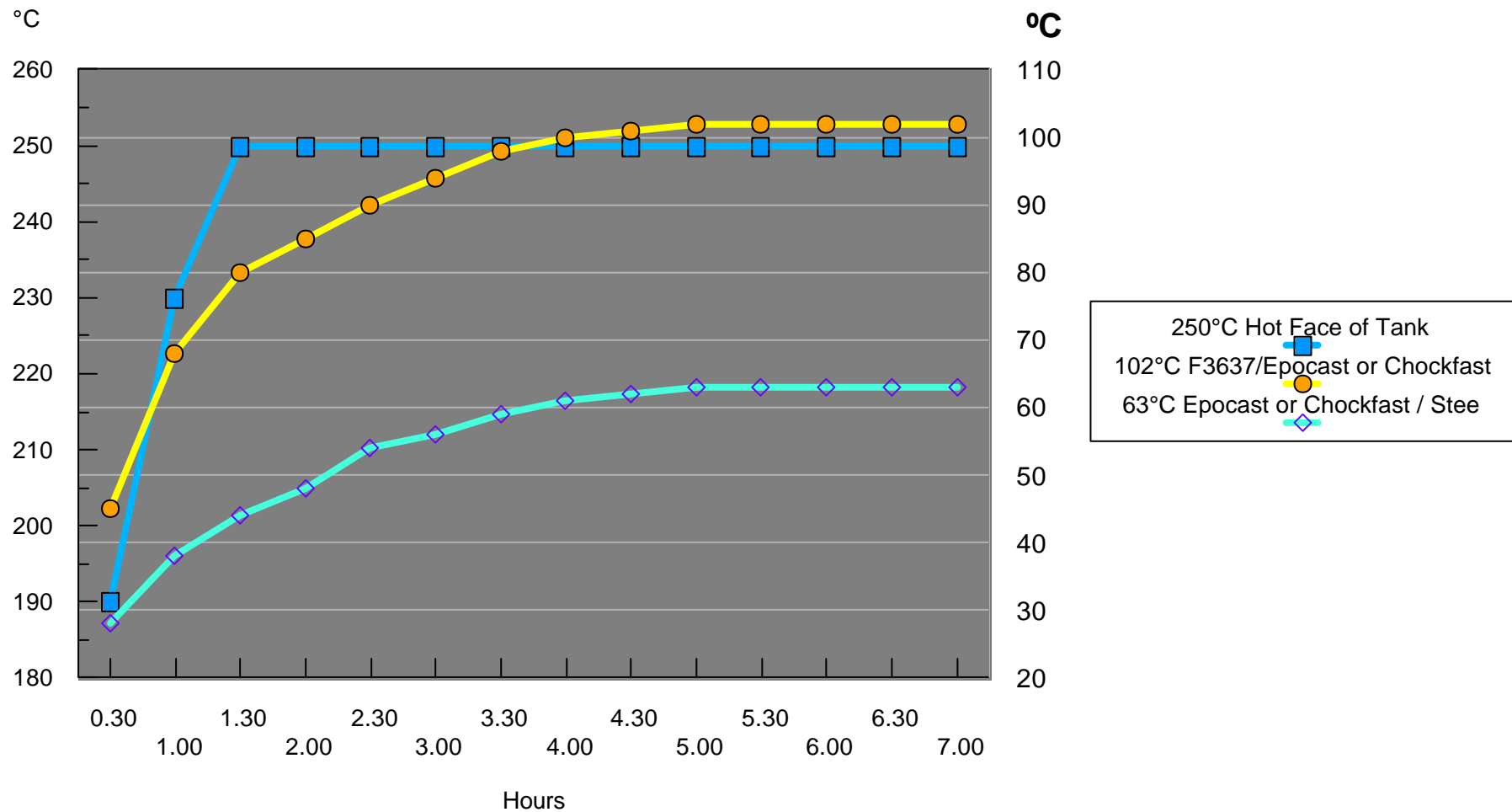


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Insulation Performance of F3637 with Liquid Bitumen Tank@250°C

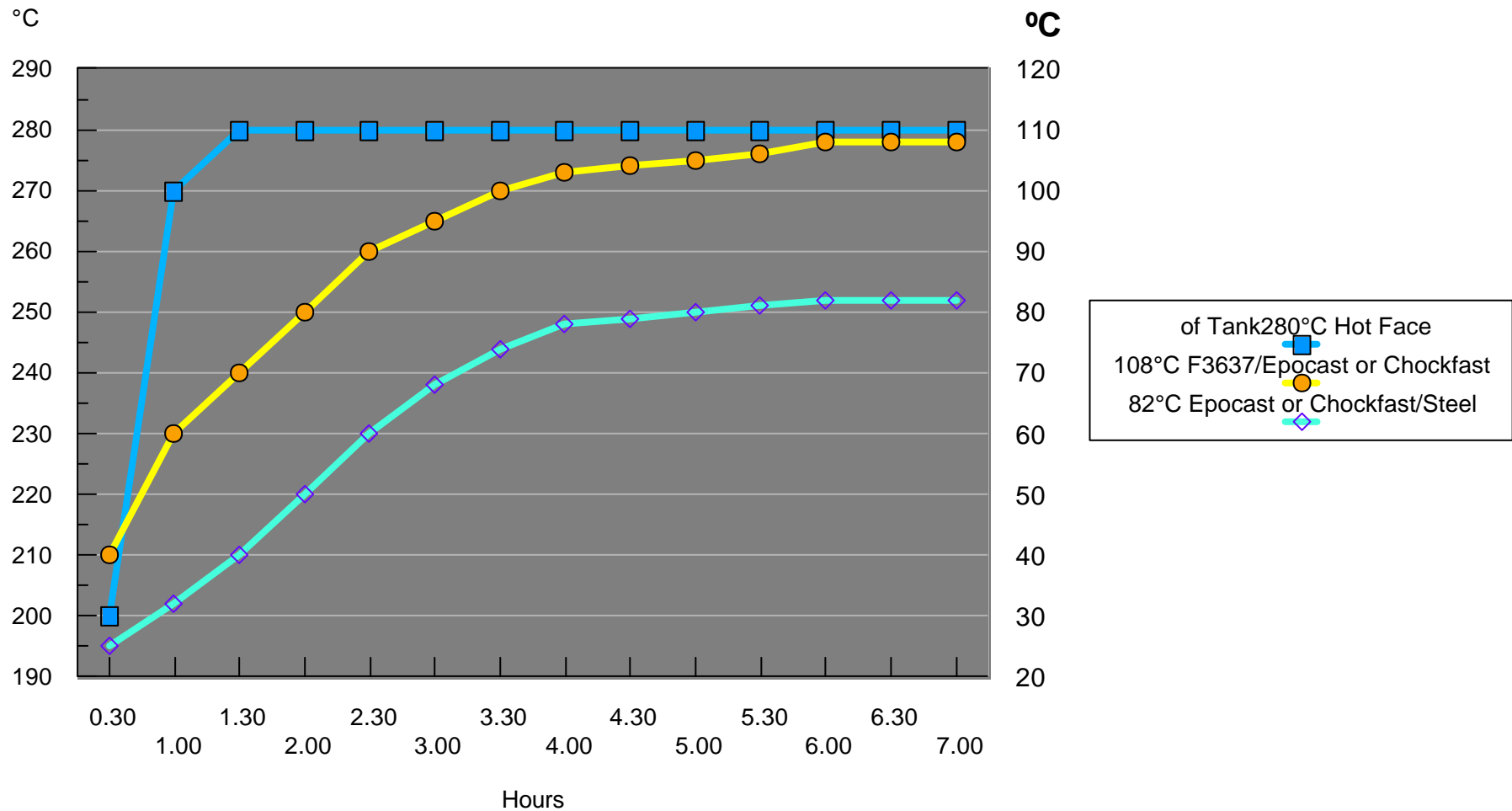


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Performance of F3637 with Liquid Coal Tar Tank@280°C



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**Kristian Jebsens Rederi: Sharpnes
Bitumen Tanker**

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**Gearbulk Shipping: Tern Arrow, Hawk Arrow, Osprey Arrow
Coal Tar and Bitumen Tankers**

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Highlights

- Cost Effective System**
- Superior Insulation**
- Increased Load per Pad**
- Sufficient Lubrication**
- Easy to Fit**
- Simplified System**
- Proven Application**
- Class Approved**

