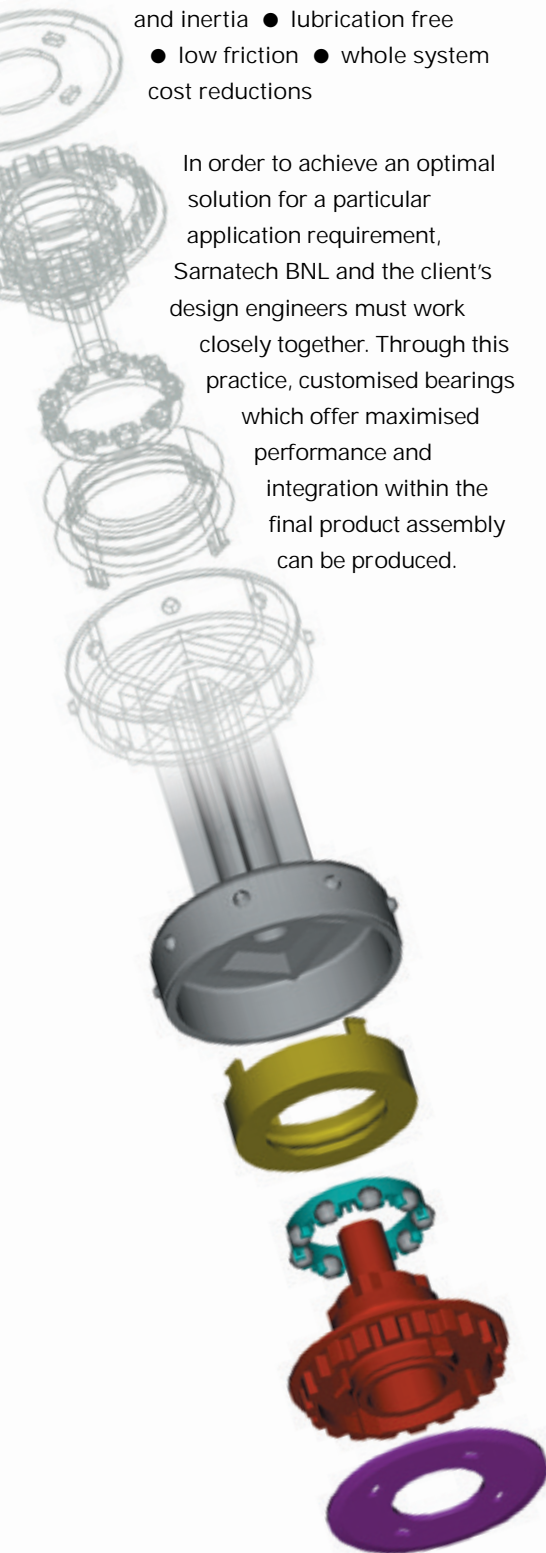


Product Benefits

At the core of all Sarnatech BNL products is the rolling element bearing. Using injection moulding to manufacture the bearing races, offers the design flexibility to provide customers with a unique range of benefits over other bearing solutions. These benefits include;

- increased functionality through feature integration
- corrosion and chemical resistance
- reduced weight and inertia
- lubrication free
- low friction
- whole system cost reductions

In order to achieve an optimal solution for a particular application requirement, Sarnatech BNL and the client's design engineers must work closely together. Through this practice, customised bearings which offer maximised performance and integration within the final product assembly can be produced.



Bearing Materials

The majority of Sarnatech BNL bearing assemblies are made from injection moulded POM (acetal). POM is a semi-crystalline material which delivers excellent long-term wear performance and is dimensionally stable when subjected to load, temperature and most fluids.

Other semi-crystalline polymers such as; PP, PA, PBT, UHMWPE, PEEK may be selected for their resistance to chemicals, temperature or radiation.

The balls used in Sarnatech BNL bearings are selected to suit the application; stainless steel is the most common choice but carbon steel, glass and POM are also available.

Rolling element bearings made from these polymers do not require any external lubricant and can therefore operate in liquids and contamination sensitive environments.

(see back page for full listing of raceway and ball materials)



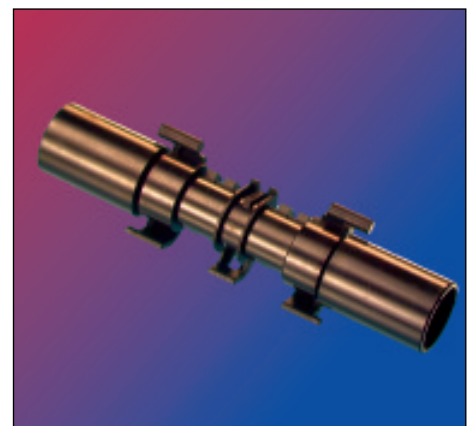
Loads, Speeds and Life

Load capacity clearly depends on the bearing life required. Bearings can be made with a single row or double row of balls, which can be with or without a cage to separate the balls. However, due to material and manufacturing constraints the practical load limit for thermoplastic bearings is in the region of 50kg.

The duty cycle is generally more important than the peak speed, this is because these materials do not readily dissipate the heat generated. For radial bearings, acceptable speeds are;

- up to 3000 rpm with intermittent running
- up to 2000 rpm if continuous and lightly loaded
- up to 100 rpm for full complement bearings (no cage)

Sarnatech BNL has the capability to calculate life expectancy for a specific bearing assembly and product application. Depending on the application needs, bearing life may be designed for between 1 million and 500 million cycles.



Operating Environment

The stable structure of POM gives it a good working temperature range. Other polymers chosen to provide resistance to temperature or specific chemicals have very different ranges. As a guide;

- POM : -40°C min to 100°C max
- PP : 0°C min to 60°C max
- PBT : 0°C min to 80°C max
- PA : 0°C min to 100°C max
- PEEK : 0°C min to 180°C max

The design possibilities for the bearing races are almost endless. Complex bearing assemblies can be created that would be impractical by any other means of manufacture. Understanding the prevailing operating conditions may lead the engineer to design the bearing with seals or shields. The inherent flexibility of the thermoplastic material enables the designer to incorporate springs and fixing features that allow for size changes due to thermal expansion.

Manufacturing Constraints

The range of practical bearing size is limited by the balance between moulding process capability and the need to maintain the structural integrity of the moulded product.

Outer-race size limits;

- maximum practical size is 150mm
- minimum practical size is 9mm

Exceptionally high moulding precision is essential for optimum bearing performance. This quality enhances the customer's finished product.

- bearing tracks are moulded to better than 0.05mm tolerance
- gear forms are made to ISO grade 6 or better

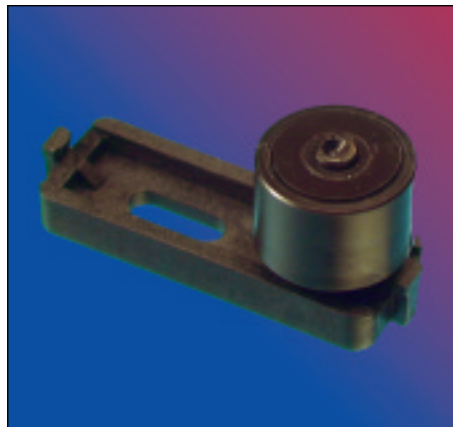
(see back page for table of general tolerance guide)

Applications

The markets served by Sarnatech BNL are diverse. The following industries and applications are some of those which have benefited from Sarnatech BNL thermoplastic bearing technology;

- Automotive · Banking · Copiers
- Film Processing · Food Processing
- Furniture · Gaming Machines
- Horticulture · Household Appliances
- Mail Sorting · Marine · Material Conveyors · Medical Equipment
- Packaging Machines · Printing · Pumps
- Rotating Emergency Lighting · Rotating Signs · Security Cameras
- Spa & Hydromassage · Sports Equipment · Swimming Pool Cleaners
- Textile Machinery · Ticketing Machines
- Vending Machines · Window Blinds

Through serving such a diverse number of clients, Sarnatech BNL has built up an unrivalled wealth of technical expertise in providing innovative cost-down bearing solutions for market leading OEMs world-wide.



PLASTIC RACE MATERIAL	
POM (acetal)	<ul style="list-style-type: none"> used in the majority of Sarnatech BNL bearings excellent bearing performance and impervious to water
PP (polypropylene)	<ul style="list-style-type: none"> good chemical resistance
UHMWPE (polyethylene)	<ul style="list-style-type: none"> excellent chemical resistance
PBT (polyester)	<ul style="list-style-type: none"> radiation and chemical resistance
PA6:12 (nylon)	<ul style="list-style-type: none"> chloride resistance
PEEK (polyetheretherketone)	<ul style="list-style-type: none"> higher temperature applications

CHEMICAL STABILITY					
Chemical	POM	PP	PBT	PA6:12	PEEK
detergents	A	A	A	A	A
chlorides	C	A	B	B	B
fuels, oils, greases	A	A	A	A	A
brake fluid	A	A	A	B	A
alkalis pH(9)	A	A	C	B	A
bleach	B	A	B	B	A
organic acids	C	A	B	C	A
inorganic acids	C	A	B	C	A
alcohols	A	A	A	A	A
aliphatic hydrocarbons	A	A	A	A	A
aromatic hydrocarbons	A	A	B	A	B
ketones	B	A	C	B	A
acetone	A	A	C	A	A

Codes: A= Suitable B= Dependant on concentration C= Unsuitable

BALL MATERIAL		
Material	Hardness (HRC)	Main areas of use
Carbon Steel AISI 1010-1016	60 min	<ul style="list-style-type: none"> with acetal races in dry applications cost conscious products
Carbon Chrome Steel AISI 52100	60 to 67	<ul style="list-style-type: none"> with steel races heavily loaded, dry applications
Stainless Steel Martensitic AISI 420	52 to 56	<ul style="list-style-type: none"> damp applications mild detergents
Stainless Steel Austenitic AISI 316	25 to 39	<ul style="list-style-type: none"> corrosive applications non-magnetic
POM (acetal)	n/a	<ul style="list-style-type: none"> wet or non-magnetic conditions electrically insulated applications
Glass	n/a	<ul style="list-style-type: none"> highly corrosive applications

BORE (mm)		
Minimum	Maximum	General tolerance
0	19	+0.10 -0.00
19	25	+0.15 -0.00

OUTSIDE DIAMETER & BEARING CLEARANCE (mm)			
Minimum	Maximum	General tolerance	Diametral clearance
0	25	+0.00 -0.10	0.05 0.15
25	50	+0.00 -0.15	0.05 0.15
50	100	+0.00 -0.20	0.10 0.20

WIDTH (mm)	General tolerance ± 0.12
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(note: these guidelines may be changed, they depend on bearing design and tool configuration)



Sarna Kunststoff

Sarnatech BNL belongs to the Swiss group, Sarna Kunststoff Holding AG – specialists in the processing and application of polymeric materials. Within this group the Sarnatech Division concentrates on the development and manufacture of technically demanding moulded thermoplastic parts, over half of which are supplied to the European automotive market. This association benefits Sarnatech BNL by providing them with the exceptional technical and purchasing strength required by leading international OEMs.

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