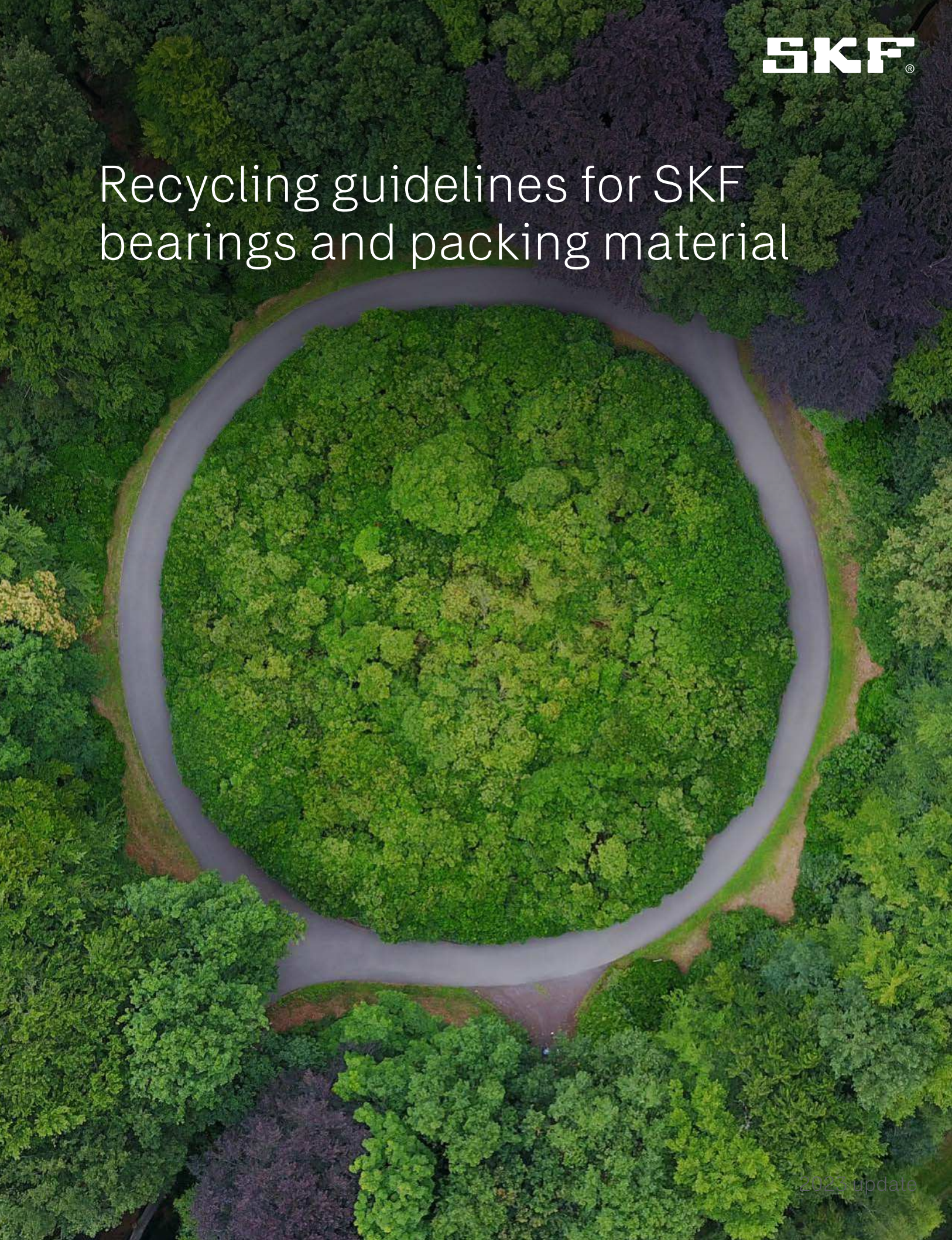
Recycling guidelines for SKF bearings and packing material



2025 update

SKF suggests to always apply the 3R waste hierarchy – Reduce, Reuse, Recycle

The world faces many environmental challenges - climate change, waste, resource scarcity, water and soil pollution to name just a few. SKF is contributing to a better, cleaner, and sustainable future.

SKF applies the concepts of reducing, reusing and recycling (3R) throughout all processes. When the 3R waste hierarchy is incorporated in the design phase along with SKF connected lubrication systems, condition monitoring, data analytics and machine learning, the SKF engineers can help to optimize the bearing selection and increase the mean time between failures (MTBF). Prolonged component and system lifetime leads to a significant reduction of parts and energy consumption, reduced maintenance costs, and improve safety.

Before a bearing reaches its end of service life, it is recommended, if feasible, to reuse the bearing with SKF Remanufacturing Services. Thanks to SKF's specialty remanufacturing capabilities, bearings are not replaced but rather given an extended life for reuse, keeping costs down, and reducing lead times, material consumption and CO2-emissions.

It is recommended that bearings removed from operation should be inspected by an SKF Application Engineer or Bearing Specialist for potential of remanufacturing and examined for any operational damage. SKF may be able to give the bearing user advice how to avoid damages in future use of the bearings. Moreover, bearings not eligible for remanufacture should be recycled to produce new bearings, effectively closing the loop.

The following are SKF's general guidelines for the recycling of:
- Bearings and components (excluding magnetic bearings)
- Bearing housings and axleboxes
- Packaging

Local legislation should always be followed. This document is only a general guideline not intended to contradict or overrule any other documents or local laws.

Bearings

Bearings are mainly made of steel. Recycling of metals enables the transformation of used and scrap metals into raw materials that can be utilized in the production of new products. This approach is highly sustainable since metals can be recycled almost indefinitely without losing their desirable properties. Similar to other recycling processes, metal recycling involves the collection and sorting of materials into specific categories.

Bearing consists commonly of the following components:

- Rings (washers for thrust bearings)
- Rolling elements
- Cage
- Seals
- Guide rings, spacers, distance rings
- Lubricant or residual lubricants

Reuse: Used railway wheelset bearings in the process of refurbishment for extended life at one of SKF Remanufacturing Service Centres

Regardless of the material, a bearing can be recycled without disassembly as general metallic materials in line with local legislation. When separated from other components, the rings and rolling elements can be recycled as high quality steel.

Each bearing component should be separated and recycled in different ways depending on its material type. If grease lubricated, the grease residual should be removed and collected for disposal according to local environmental legislation and waste management routines. Industrial greases should always be disposed at an industrial waste disposal facility since they can contain toxic chemicals that might be hazardous to aquatic life.

Examine the bearing to determine if remanufacturing is a possibility. Contact your local SKF sales office or SKF Authorized Distributor to help evaluate if the bearing has potential for remanufacturing. If the bearing is to be scrapped, follow guidelines below for each individual component.

Full steel bearings

If the bearing cage is made of sheet steel metal, the whole bearing can be recycled as metallic material. No disassembling of the bearing is needed. If possible, any visible residual lubricant can be collected for disposal according to local environmental legislation and waste management routines.

Bearings with mixed materials

Disassemble the bearing into its components as far as possible. If it is not possible to separate the non-steel components, recycle the bearing as general metallic material. Coated bearings (such as INSOCOAT, NoWear, black oxidizing, etc.) can be recycled as steel. The amount of coating is very small compared to the volume of steel.

Steel components to be recycled as steel:
- Rings and washers (high quality steel),including coated bearings such as INSOCOAT
- Steel sheet and iron cages
- Steel rolling elements (high quality steel)
- Steel sheet shields
- Steel guide rings and steel distance rings
- Steel fasteners

Cages

SKF has a number of different cages types

Cage type	Recycling as
Brass cages (all types)	Recycle as brass, if pure brass recycling not available recycle as metallic materials
Iron casted cages	Steel
Polymer PA66 (all types)	Plastic
Polymer PA 46	Plastic
Polymer PEEK	Currently hard to recycle, but can be sorted as plastic
Sheet steel cages	Steel

If it is not possible to separate the cage in an easy way from the rings and rolling elements, recycle the whole bearing as general metallic materials.

- Steel cages

Sheet steel cages and iron cages can be recycled as steel. Most often there is no need to disassemble a bearing with steel cages. The whole bearing can be recycled as steel.

- Brass cages

Bearings with brass cages that are difficult to disassemble (without destruction of the cage) should be recycled as general metallic material and taken care of by a licensed disposal facility. Brass is a copper alloy containing lead, up to a maximum concentration of 2.5%, consequently, extra attention is needed during handling. Brass cages which are easily separated without destruction are preferably recycled as pure brass. See appendix A

- Polymer cages

SKF has three types of polymer cages; Polyamide 66 (PA66), Polyamide 46 (PA46) and PEEK (polyetheretherketone).

  - Polyamide cages (PA66, glass fibre reinforced or not, and PA46) can be recycled as plastic material.
  - PEEK cages are currently hard to recycle. Check with local recyclers if they recycle PEEK as a separate material. PEEK material can be used as a fuel in some manufacturing processes and can be sorted as plastic.

It can be difficult to distinguish between the different polymer materials without examining the detailed bearing designation. (Descriptions of the cages materials for each product can be found at www.skf.com) All polymer, including PEEK cages can be sorted as plastics.

Ceramic rolling elements

A general reuse of ceramic rolling elements is currently not possible. However, for specific applications and selected bearing types, dedicated SKF Remanufacturing Centres offer to reuse the ceramic components. SKF is running development projects to establish the reuse and recycling of ceramic rolling elements on a large scale.

Until complete reuse and ceramic mono-material recycling is feasible, they need to be scrapped and recycled as ceramic rubble. Ceramic rubble can be reused in the manufacture of cement, asphalt, fireproof bricks, etc. However, depending on your local laws and recycling centres, recycling of ceramics is still a process that is not fully developed globally (as it is with steel) and some of the ceramic materials instead end up in landfills. The finely grounded ceramic is an inert material that does not react with surrounding environment.

The whole bearing is to be recycled as metallic material if the rolling elements are not easily separated. However, it is preferred to recycle each separate material.

Ceramic rolling elements	Recycling as
Ceramic rollers, balls	Not yet possible to mono-material recycle, discard accordingly to the local legislation

Seals and metal shields

Seals are mechanical devices made of elastomeric materials and steel and have a fundamental function to prevent leakage of lubricants from a bearing or system and block contamination ingress. Seals normally consist of the elastomeric part doing the sealing function chemically attached to a metal component to provide the necessary stiffness. They are typically designed to be flexible and compressible, to provide a secure and tight seal under various conditions of the bearing application.

In some bearing configurations where speed and/or friction is critical, a metal shield is used to protect the bearing.

Elastomeric seals can be made from several types of materials such as NBR, HNBR, ACM, AEM and FKM. During the vulcanisation process the raw seal material is transformed into the designed shape with the desired hyper elastic characteristics and is also chemically bonded to the metal component. In its bonded condition, seal material cannot be easily separated from the metal. Hence:

- Elastomeric seal materials cannot yet be recycled in the same way as steel.
- Elastomeric seals materials cannot be easily separated.
- Sheet metal shields can be recycled as steel material.

Seal type	Recycling as
PTFE	Not yet possible to recycle, discard accordingly to the local legislation
Seals using synthetic materials (NBR, HNBR, ACM, AEM, FKM) + metal component	Not yet possible to recycle, discard accordingly to the country law
Steel metal shields	Steel

⚠ WARNING

At temperatures above 300 °C *(570 °F)*, all fluoroelastomers (FKM and PTFE compounds) give off dangerous fumes. **Please read Appendix B** for handling of fluoroelastomers subjected to these temperatures.

Other bearing and unit components

Bearings and bearing units depending on could include other internal or adjacent components such as guide rings, spacers, distance rings, lock rings etc. They are typically made of metallic material and should be recycled as such or polymer materials that should be recycled as plastics.

Bearing housings and axleboxes

SKF housings & axleboxes are typically made of either grey cast iron or spheroidal graphite cast iron. Grey cast iron is the standard material for most SKF housings. SKF also offers aluminium axleboxes or housings. Any seal or shield should if possible be separated from the main housing. (see Chapter seals/shields for instruction).

Housing/axlebox type	Recycling as
Aluminium	Aluminum
Grey cast iron	Steel or metallic materials
Spheroidal graphite cast iron	Steel or metallic materials

Aluminium alloys (in particular grades for casting) can contain some lead (up to a maximum concentration of 0.4%): extra attention is needed during handling. **See appendix A**

Packaging material

Packaging material consists of primary (product) packaging and secondary (transport) packaging. Lists of primary and secondary packaging are found below.

Much of the SKF packing materials are marked with recycling symbols. Local markets have different legislation regarding symbols on packing material. SKF follows local legislation on the printing of packing symbols. Recycling of packing material should be done according to the symbols on the packaging material and local law. If your country is not using packing material symbols, see the general recycling guidelines for packing material below.

It is essential to remember to remove all loose packaging material from the box, before it is placed in the recycling bin. Some plastic tapes and void fill cannot be recycled along with standard paper and cardboard. When the general material cannot be identified dispose as general waste.

Primary (product) packaging

Packaging material	Recycling as
Carton boxes	Paper
Industrial KLT	Recirculate to SKF
Industrial packing cartons	Paper
Plastic	Plastic
Plastic tubes	Plastic
Plywood boxes	Wood
Pouches	Plastic
ProofBox	Return to SKF or recycle as plastic PP

Packing consumables

Packaging material	Recycling as
GSP plastic bags	Plastic
Other packaging plastic materials, like tapes, stretch film wrapping, dunnage material in plastic, foam	Plastic
Plastic liners/sheets	Plastic
Plastic strapping	Plastic The material is classified by its colour Green = PET (Polyester) White and black = PP (Polypropylene)
Tape	General waste
VCI paper	Paper
VCI plastics	Plastic
Wrapping film for products	General waste*

* Multilayer films are not yet recyclable but needed for preservation purposes

Secondary (transport) packaging

Packaging material	Recycling as
Corrugated transport box	Paper
Corrugated paper pallet	Paper
One-way plywood box	Wood
One-way pallet	Wood
Plastic strapping	Plastic The material is classified by its colour. Green = PET (Polyester) White and black = PP (Polypropylene)
Standard SKF pallet & collar	Recirculate to SKF

Handling of waste to be recycled

SKF suggests the following for the handling of waste material to be recycled:

- All containers used to store waste material should be in good condition and free of leaks, holes, rust, etc. The containers should be made of or lined with material which will not react with the waste. The containers should always be closed except when adding or removing waste.
- All waste containers should be clearly labelled identifying the waste material.
- Waste storage areas should be inspected frequently, especially looking for leaks and deterioration of the containers and the containment.
- All employees should be well informed and trained on how and where to dispose of waste material in a proper way.
- On-site handling and treatment of waste should only be performed by specially trained personnel or licensed contractors.
- Shipping of waste should be done by licensed contractors.
- Waste should only be sent to licensed treatment or disposal facilities.

Additional questions

If having additional questions regarding SKF Remanufacturing Service or specific material or recycling questions, please contact your local SKF representative.

Appendix A

Lead is an alloying element commonly found in meaningful quantities in many metal alloys used in the manufacture of bearings. Amongst these materials, the most common in brass. Lead can be also found in aluminium alloys, bronze and in some steel grades (but not bearing steel, where lead is present only as a trace contaminant).

Lead is classified according to the CLP[1] harmonized classification as a substance toxic for reproduction (hazard codes H360 and H362) and identified by many chemicals manufacturers as carcinogenic (H350) and a specific target organ toxicant (H372). Lead is consequently subject to multiple legal requirements in Europe and in other countries. It is for example classified as an SVHC under REACH[2].

The main routes to lead exposure are ingestion and inhalation. Permeation via skin is minimal, in particular for metal alloys, where the substance is contained in a metal matrix.
In normal conditions of use, professional users of the industrial components made by SKF can only come in contact with this substance by physical contact.

Professional users are consequently recommended to handle products with brass cages or aluminium components with gloves (as recommended in the “SKF bearing maintenance handbook”, PUB SR/P7 10001/1 EN) as a protection from risk of exposure on the hands that might subsequently result in ingestion.

Operations such as welding, cutting, machining can generate dust and/or fumes. if particulate concentration exceeds local limits approved respirators should be used.

[1] Classification, Labelling and Packaging of substances and mixtures, Regulation (CE) 1272/2008

[2] Registration, Evaluation, Authorization and restriction of Chemicals, Regulation (EC) No 1907/2006

Appendix B

⚠ WARNING

At temperatures above 300 °C (570 °F), all fluoroelastomers (FKM and PTFE compounds give off dangerous fumes. This can occur, for example, if a welding torch is used when removing a bearing. Although the fumes are only produced at such high temperatures, once heated, the seals will be dangerous to handle even when they have cooled down. If it is necessary to handle PTFE or fluoroelastomer seals that have been subjected to the high temperatures mentioned above, the following safety precautions should be observed:

- Protective goggles and gloves should always be worn.
- The remains of seals should be put in an airtight plastic container marked “Material will etch”.
- Comply with the safety precautions included in the material safety data that can be provided upon request.

If there is contact with your skin, this should be washed with soap and plenty of water. Wash your eyes with plenty of water if these materials get into your eyes. A doctor should always be consulted. This also applies if the fumes have been inhaled.

www.skf.com

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Authors:
Marica Ersson
Katarina Wising

With contribution of:
Amra Cenanovic
Stefano Marzola
Thomas Winkler
et al.