



SUPERMICRO SUPERSERVER RECYCLABILITY ASSESSMENT

Recyclability Assessment of Supermicro Server
Products Based on IEC TR 62635 Standards

ABSTRACT

THE IEC TR 62635 STANDARD SPECIFIES INFORMATION THAT MANUFACTURERS AND RECYCLERS CAN EXCHANGE FOR PROPER END-OF-LIFE TREATMENT. SUPERMICRO (SMC) ENVIRONMENTAL COMPLIANCE TEAM CONDUCTED A RECYCLABILITY ASSESSMENT ON SERVER PRODUCTS USING IEC TR 62635 METHODOLOGY. PRODUCTS WERE ASSESSED BY AN INDEPENDENT LAB ACCORDING TO THE STANDARD. THIS PAPER DESCRIBES CALCULATION, REUSE, AND RECYCLING METHODS OF SMC SERVERS.



1. Introduction

The IEC TR 62635 standard, "*Guidelines for end-of-life information provided by manufacturers and recyclers and for recyclability rate calculation of electrical and electronic equipment*," is a technical report published by the International Electrotechnical Commission (IEC). The purpose of this standard is to harmonize the methodology for calculating recyclability and recoverability rates based on product attributes and end-of-life practices. This document briefly summarizes the recyclability assessment of Supermicro Server products based on IEC TR 62635. This product was assessed by a recycler, and the results were reviewed by an independent lab.

2. Products

We assess the recyclability of the following system servers

1. IoT SuperServer SYS-211E-FRN2T

3. IEC TR 62635 Recyclability Assessment

IEC TR 62635 addresses the importance of information exchange between manufacturers and recyclers and provides a method for calculating the recyclability rate. The standard also aims to improve the efficacy of recyclability (and other end-of-life treatment operations - reuse, recovery, etc.) in efforts of environmentally conscious design. Recyclability is defined as *processing waste from its original purpose or other purposes, excluding energy recovery*. The recyclability rate is the *ability of waste product parts or materials to be reused or recycled*.

Treatment			
Recovery			Residue disposal
Recycling		Energy recovery	
Reuse of waste products and waste product parts	Material recovery		

Figure 1 - Framework for defining end-of-life treatment (IEC 2012)

Calculating Recycling Rate

According to IEC TR 62635, recyclability and recoverability rates can be calculated with the following formulas:

Recyclability rate:

$$R_{cyc} = \frac{\text{Sum of recyclable masses of each parts}}{\text{Total product mass}} \times 100\%$$

End-of-life (EOL) treatment scenarios are used when calculating electrical and electronic equipment's recyclability and recoverability rates. Rates depend on local infrastructure for EoL treatment and product design characteristics. They can fluctuate depending on the market value of both the recycled material and EoL treatment infrastructure. Supermicro worked with a recycler and provides recyclability rates.

End-of-Life treatment process phases



The IEC recyclability standard defines four end-of-life treatment phases: pretreatment, material separation, energy recovery, and disposal. Pretreatment involves dismantling and requires selective treatment. Material separation covers mechanical, chemical, and thermal separation techniques with appropriate sorting. After material separation, the remaining unsorted materials can be considered for energy recovery. The remaining residues are disposed of in landfills. Figure 2 is a flow chart overseeing the end-of-life process.

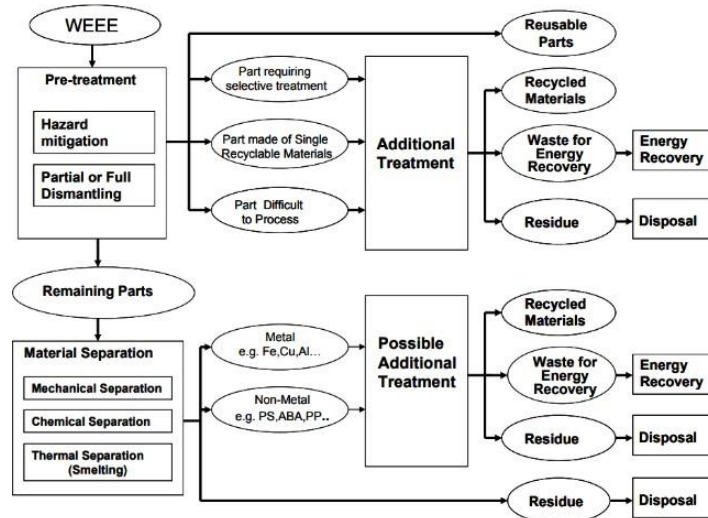


Figure 2 - End of life treatment process phases (IEC 2012)

4. Assumptions, Methodology, and Calculation

This section describes the methodology used to complete the recyclability assessment. A key part of the IEC standard is the information exchange between recyclers and manufacturers. A third-party test lab was sent Supermicro Superserver systems to conduct the test report. Supermicro sent the test lab disassembly instructions according to the WEEE Directive 2012/19/EU (Recasting 2002/96/EU) Article 4, 11, 15(2) & Annex V, and the submitted samples were evaluated in accordance with this directive. Detailed information about the product regarding proper treatment depending on the substance contained, materials and components requiring selective treatment, and weights and recycling/recovery rates were exchanged. The test lab confirmed conformance with the requirements in the directive, such as, but not limited to, unique identification of brand name, trademark, and correct markings, and that dismantling and recovery of components and materials is considered during the equipment's design and production.

5. Recycling Technology

This section describes the end-of-life processes Supermicro has implemented. After untreated waste equipment enters the contracted recycling facility, it is dismantled and sorted to determine if the equipment is reusable for soft tear-down (when parts from the main unit can be reused) or for materials recovery. Waste equipment deemed suitable for reuse is further processed, and its parts are removed and tested. All other equipment is sent to materials recovery. During materials recovery, equipment is broken down further and sorted into its basic elements (i.e., steel, copper, aluminum, circuit boards, plastics, batteries, etc.). The server product was broken into the following streams for recycling:



- Precious Metal Processor: RAM, system board, other circuit boards, heatsink, server backplane
- Metal Smelter: metal parts of HDD and fans, screws, metal brackets, chassis metallic parts, metal from cable
- Plastic processor: Polycarbonate, ABS or other resin plastics parts of bezel, tray, air shroud, plastic from cables
- Batteries are sent to the battery recycler.

To achieve the recyclability rates documented in this assessment, the recycling technologies involved included dismantling, selected disassembly and treatment, mechanical shredding, chemical separation, and smelting (extracting metal from its ore by the process of heating and melting).

6. Results

The test report documented which materials and components should be selectively treated and which could be recycled and recovered. The test lab provided results on the weights (g), percent weights, recycling rates, energy recovery rates, and recovery rates of the materials and components. All the servers tested passed the conformance check with the WEEE directive and met the minimum recycling rate of 80% and recovery rate of 85% for large equipment. The table below shows the list of key components, their weights as a percentage of the whole system, and their recyclability rates.

Table 1: Weight and recyclability rate for IoT SuperServer SYS-211E-FRN2T

Components	Weight (g)	Percent Weight (%)	Recyclability rate (%)
Cable	106.00	0.88%	90.00%
Chassis	6,591.00	54.79%	93.00%
Circuit Board	1,159.00	9.63%	85.00%
CPU	137.00	1.14%	100.00%
FAN	920.00	7.65%	93.00%
GPU	278.00	2.31%	89.00%
Heatsink	554.00	4.61%	93.00%
Plastics	122.00	1.01%	82.00%
PSU	1,963.00	16.32%	88.00%
Storage	188.00	1.56%	93.00%
Battery	12.00	0.10%	100.00%
Total	12,030.00	100.00%	91.27%

Fig. 3 1. IoT SuperServer SYS-211E-FRN2T



$$R_{cyc} = \frac{10979.74}{12,030} \times 100\% = 91.27\%$$