

TALAT Lecture 3503

Finishing and other Supplementary Operations

8 pages, 7 figures

Basic Level

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Objectives:

- To describe supplementary fabrication measures for impact extruded parts and give some examples of finished impacts

Prerequisites:

- Basic knowledge about the formability of metals
- Background in mechanical engineering

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3503 Finishing and Other Supplementary Operations

Table of Contents:

3503	Finishing and Other Supplementary Operations	2
	Choices and Criteria for Finishing Impacts	2
	Examples for Finished Impacts	3
	Cleaning of Aluminium Parts	6
	Heat-Treatment after Impact Extrusion	7
	Literature	8
	List of Figures	8

Choices and Criteria for Finishing Impacts

It is possible to produce more complicated impacts by using supplementary process steps. Such processes consist normally in cutting, stamping, blocking, coping as well as flanging, and crimping at right angles to the pressing direction. Transverse holes, threads and undercuttings are mostly machined. It is even possible to produce complicated forms by a supplementary forming operation performed after the impact extrusion, like for example contracting (necking) for bottlenecks and drawing of rods and tubes or even expanding and flaring or tapering. It is also possible to use welding and other joining methods to produce fastenings. Friction welding has proved very successful for axially symmetrical parts, making it possible to join dissimilar alloys or even dissimilar materials with each other, like for example aluminium with steel or copper. For economical reasons it is of paramount importance to first consider whether the supplementary process steps required after the impact extrusion can be avoided or at least reduced to a minimum by a judicious design of the impact extruded parts [1].

Finishing and other Supplementary Operations for Aluminium Parts

It is possible to produce more complicated and intricate parts by using finishing and other supplementary processes:

- Cutting (trimming, piercing);
- Forming (contracting, expanding, flaring, flanging, folding, collaring, crimping, drawing, thread forming);
- Machining (drilling, turning, milling);
- Joining (welding, brazing, soldering)

Source: IFU Stuttgart



Finishing and other Supplementary Operations
for Aluminium Parts

3503.01.01

Figure 3503.01.01 and **Figure 3503.01.02** describe choices and criteria of supplementary working or finishing processes of aluminium impacts.

Criteria for Finishing and Supplementary Working of Aluminium Impacts

- Good machining properties
- Cold formability
- Weldable
- Capable of brazing and soldering
- Complete heat treatment possible
- Anodic coatings (decorative and functional)
- Galvanic coatings
- Organic coatings
- Ceramic and metallic coatings (plasma spray)




Criteria for Finishing and Supplementary Working
of Aluminium Impacts

3503.01.02

Examples for Finished Impacts

Figure 3503.01.03 shows examples of aluminium impacts which have been machined after the impact extrusion process.

Machine Finished Impacts



Source: Aluminium-Zentrale e.V.



	Machine Finished Impacts	3503.01.03
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Figure 3503.01.04 illustrates examples of aluminium impacts which have undergone a finishing or other supplementary forming operation after the impact extrusion process.

Supplementary Finishing Operations for Impacts

Using Crimping, Flanging, Blocking or Coping and Holing or Piercing



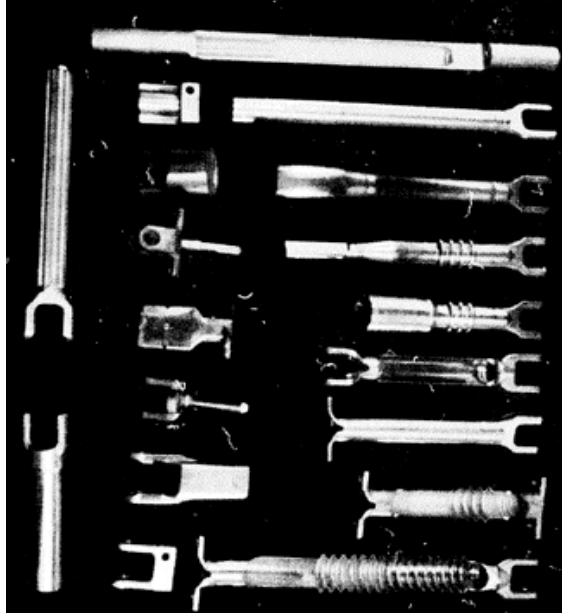
Source: Aluminium-Zentrale e.V.

	Various Supplementary and Finishing Operations for Impacts	3503.01.04
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The aluminium impacts shown in **Figure 3503.01.05** and **Figure 3503.01.06** are

examples of impacts successfully used in the automotive and electronic industry, showing the diversity of parts which can be produced by impact extrusion followed by supplementary finishing operations.

Impact Extruded and Finished Aluminium Parts for the Automobile Industry



Source: Raufoss A.S.



Impact Extruded and Finished Aluminium Parts for the Automobile Industry

3503.01.05

Impact Extruded and Finished Aluminium Parts for the Electronic Industry



Source: Philips AMEFO, Zwolle



Impact Extruded and Finished Aluminium Parts for the Electronic Industry

3503.01.06

Cleaning of Aluminium Parts

Although a large number of lubricants in use can be removed using both watery solutions or organic solvents, some lubricants can only be cleaned-off using either of these alternatives. The latter can be removed either only with the help of watery solutions or with another solvent. Both cleaning methods can be used for alkaline soaps and oils, while work-pieces lubricated with alkaline soaps can only be cleaned using watery solutions.

The solvents most often used are chlorinated hydrocarbons (e.g. PER). The equipment used must consist of closed systems which fulfil the legally binding environmental and health regulations. The cleaned parts which leave the equipment must be completely dry.

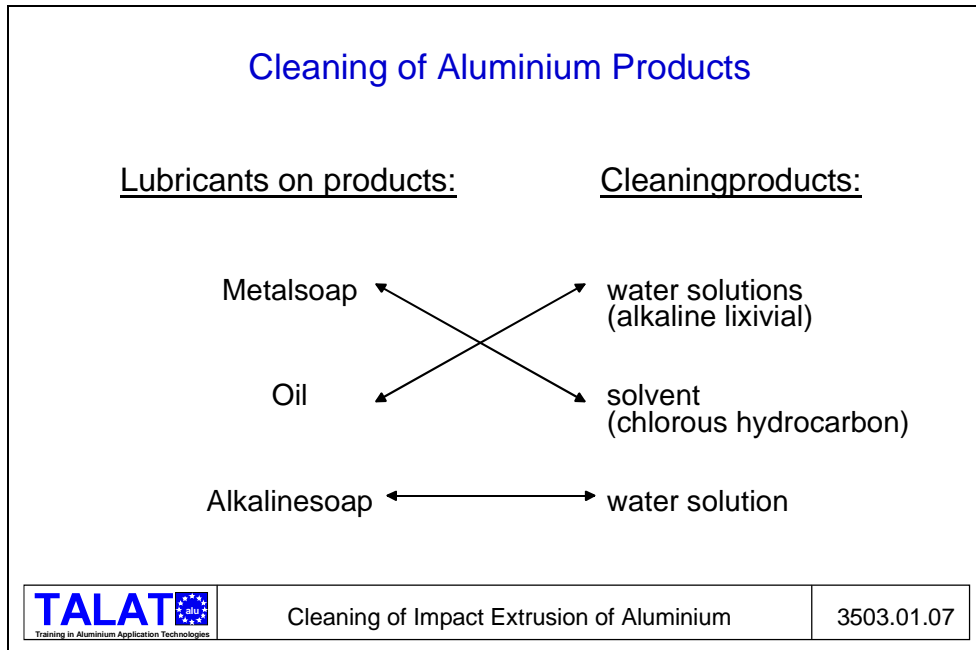
For removing metallic soaps with watery solutions, highly alkaline cleaning solutions are necessary. Depending on the type, concentration and time of contact of the cleaning liquid used, a surface layer of the material is also removed along with the lubricant. The cleaning effect can be enhanced by increasing the temperature of the cleaning liquid and by using supplementary mechanical methods, like spraying with a defined pressure.

After degreasing, the parts must be neutralised, rinsed several times (partly with deionised water) and finally dried. Changes in the bath process can lead to dimensional deviations (reacting time, concentration of the washing liquid) or to residues in the part (cleaning liquid residues can lead to blistering, which, in some cases may occur only after a certain length of time).

Due to the removal of the material surface layer, bright parts become dull and the surface roughness increases. But at the same time, scales from the impact extrusion process which adhere to the surface and cannot be removed by solvent cleaning, are also removed. For lubricants which are soluble in watery solutions, a mildly alkaline cleaning liquid, in which the metal attack is reduced by the addition of inhibitors, normally suffices. A neutralising step, followed by a series of rinsing steps is essential even in this case.

The drying of parts with recesses and indentations which have been cleaned using alkaline solutions is very problematic, since the cleaning liquid trapped in these cavities should be removed before the drying operation, in order to keep heat energy requirements for drying low. Solvent cleaning can be used for all parts. Watery cleaning solutions are not suitable for parts with narrow holes and deep, narrow blind holes, since too much uncleaned residue can remain here. Normally a particular cleaning method is not specified, as long as it can be guaranteed that a certain specified rest residue is not exceeded. In cases for which a certain cleaning method is specified as being obligatory for a product, this fact must be considered when choosing the appropriate lubricant for the impact extrusion process [2].

Figure 3503.01.07 gives a rough survey of the steps involved in the cleaning of aluminium parts.



Heat-Treatment after Impact Extrusion

When impact extrusions have to be heat-treated (solution treatment, quenching, aging), the fresh impact has to be cleaned (cleaning medium: solvent) in order to prevent the uncontrolled development of irritating vapours and smell. The annealing residues, on the other hand, are no problem, if the raw part is machined all over in a number of machining steps. However, a second cleaning operation is required so that the finished part can be delivered without any adhering grease or oil [2].

Literature

[1] Aluminium-Zentrale e.V., Report No. 29 "Aluminium für technische Fließpreßteile", Dusseldorf, 1982.

[2] D. Schlosser: Einflußgrößen auf das Fließpressen von Aluminium und Aluminiumlegierungen und ihre Auswirkung auf die Weiter- und Fertigungsarbeit der fließgepreßten Rohteile. In seminar volume "Gestalten und Fertigen von technischen Fließpreßteilen aus Aluminium", Stuttgart, Institut für Umformtechnik, Universität Stuttgart, 15.-16- June, 1992.

[3] D. Brix: Kaltfließpressen von Leichtmetall - Qualität und Wirtschaftlichkeit. Draht (1975)5, p. 216 - 219.

[4] VDI-Richtlinie 3138: Kaltfließpressen von Stählen und Nichtmetallen, Grundlagen, Blatt 1. Berlin: Beuth-Verlag 1970.

List of Figures

Figure No.	Figure Title (Overhead)
3503.01.01	Finishing and other Supplementary Operations for Aluminium Parts
3503.01.02	Criteria for Finishing and Supplementary Working of Aluminium Impacts
3503.01.03	Machine Finished Impacts
3503.01.04	Various Supplementary and Finishing Operations for Impacts
3503.01.05	Impact Extruded and Finished Aluminium Parts for the Automobile Industry
3503.01.06	Impact Extruded and Finished Aluminium Parts for the Electronic Industry
3503.01.07	Cleaning of Impact Extrusion of Aluminium