LÖMI

Solvent Debinding Systems for PIM and AM from the World Market Leader

30 years: 1991–2021

Technology Leader in Solvent Recycling and Solvent Debinding

Key plant equipment supplier for the CreaSolv® Technology – the world's most versatile physical plastics recycling process

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LÖMI – GERMAN ENGINEERING

- Established in 1991 – 30 years of experience in process technology
- LÖMI is engineer-operated, almost half of our staff are engineers
- In-house design engineering and safety engineering departments
- Including technical consulting and support of your project planning
- Accredited company according to the EU Water Framework Directive
- Numerous research and development projects with renowned partners from industry, universities and research organisations

REFERENCE CUSTOMERS

We are proud to count the big players in the various industries among our customers:

- Alcatel
- Bosch
- Carl Zeiss
- Continental
- Ericcson
- Indo-MIM
- Motorola
- Osram
- Philips
- Procter & Gamble
- Samsung
- Siemens
- Swarovski
- Unilever
- Würth

LÖMI – INDUSTRY STANDARD

LÖMI, an owner-managed company, has been a pioneer in environmental technology since its formation. Our systems are operated world-wide and have set many standards in numerous industrial sectors:

- Automotive, Aerospace
- Plastics, Chemical
- Optical
- Surface Technology
- Electronics
- Printing & Packaging, Paints
- Industrial Component Cleaning
- Pharmaceutical, Medical

SOLVENT DEBINDING SYSTEMS from the World Market Leader

For Powder Injection Moulding PIM (MIM / CIM) and Additive Manufacturing AM / Industrial 3D Printing

LÖMI and the PIM and AM Industries

Powder Injection Moulding (PIM) technologies offer the possibility to produce net shape parts and are recommended for large series of small parts. Additive Manufacturing (AM) is more suitable for the production of small or medium series of parts, while the parts can be larger – up to several kilograms. The process offers improved capacity to produce complex metal parts thanks to greater design freedom.

LÖMI was established in 1991 as a manufacturer of Solvent Recycling Systems. Our involvement in the PIM industry dates back to 2001. We were approached by a feedstock producer who was looking for a Debinding System for solvent-soluble binders, where the moulded parts would be immersed in a solvent bath. We adapted a Solvent Recycling System to meet the customer's requirements and hereby developed the first Solvent Debinding System.

Since then, we have been supplying Debinding Systems for injection moulded and additively manufactured parts with considerable success and have become the world market leader for Solvent Debinding Systems in just four years. Our steady growth is a result of a comprehensive understanding of the debinding process, based on many years of collaborative research with universities and research institutions. We also work closely with powder and feedstock producers, as well as PIM and AM parts manufacturers. Our systems are operated world-wide in the automotive, aerospace and medical industries, among others.

Why our customers choose LÖMI

We are privileged to count some of the world's leading PIM/AM parts manufacturers among our customers.
Just one of our many customers in the watch industry operates fifteen of our systems, and the world's largest manufacturer of PIM parts uses thirty-six large-scale LÖMI plants to date.
Currently, there is a lot of activity in the debinding market, and many part producers are changing to LÖMI's Solvent Debinding Technology.

Performance and Efficiency

- The LÖMI Solvent Debinding Technology yields excellent quality of parts manufactured by the Powder Injection Moulding PIM (MIM/CIM) and Additive Manufacturing AM / Industrial 3D Printing processes
- 3 high-performance processes in one single LÖMI system:
  - Debinding of parts
  - Drying of parts
  - Solvent recovery
  - Saving time and costs, as no additional handling of the brown parts is required between debinding and drying
- Long durability of LÖMI systems due to low wear and tear of Solvent Debinding Technology
- Excellent process reliability, well proven technology
- Wear-free rollers in removable batch loading mechanism for highest surface quality of the parts and for easy cleaning of the debinding chamber
- Fresh debinding medium at all times by outstanding LÖMI recycling quality:
  - Recycled solvent debinding medium has the same physical and chemical properties as new medium
  - Recovery rate up to 99 percent
  - Consistent quality of debinding medium

LÖMI SOLVENT DEBINDING SYSTEMS

Why our customers choose LÖMI

Versatility

- LÖMI Debinding Systems can be individually adapted to your process
- Many different organic solvents can be used: ethanol, isopropanol, acetone etc.
- Systems are available from 15 liters of batch loading volume up to 1,200 liters, while all systems can be extended on a modular basis
- Large variety of system options
- Large variety of auxiliary equipment such as loading carts and trays, saving time during the production process

Cost Savings

- Rapid amortization of a LÖMI Solvent Debinding System
- Low energy consumption through strong insulation and efficient design
- Continuous cost savings by integrated recovery of solvent debinding medium

Comfort

- Fully customizable automated processes by Programmable Logic Control PLC
- Real-time parameter visualization and process traceability through touch panel
- Integrated tanks
- Ergonomic front operation, easy loading and unloading of parts
- Compact design and minimal floor space

Safety

- Explosion-proof according to ATEX Directive 2014/34/EU (ATEX 114)
- Safe for work and environment-friendly through LÖMI Advanced Clean Technology and closed system

Service

- High service standard along the entire process chain
- Comprehensive and honest technical consultation before you purchase a system
- After the purchase, we will support you in person, by telephone or by remote maintenance in operating your LÖMI system

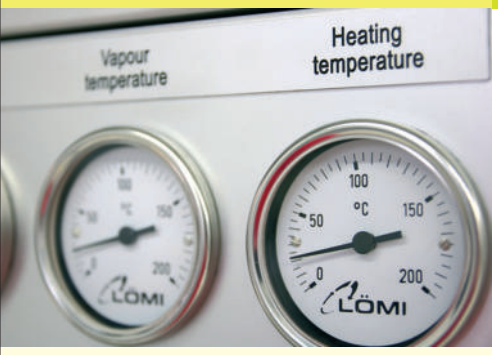
LÖMI PROCESS TECHNOLOGY

- INNOVATION
- PERFORMANCE
- RELIABILITY

Advantages of LÖMI's Solvent Debinding Technology

Compared to other debinding technologies, LÖMI's Solvent Debinding Technology has numerous advantages, the most important of which are:

- Low energy consumption due to a low temperature process
- Minimal wear and tear, no nitric acid
- Very compact system dimensions, minimal floor space
- Parts manufacturers are free to choose their feedstock producers, as numerous different feedstocks can be debound with the LÖMI Solvent Debinding process. This allows parts manufacturers to test different feedstocks or to choose a new feedstock producer without having to invest in another debinding technology.



POWDER INJECTION MOULDING PIM

LÖMI Debinding Systems for Powder (Metal and Ceramic) Injection Moulding

Powder Injection Moulding is a process for manufacturing geometrically complex parts from materials that are demanding with regard to machinability, such as carbide or ceramics. Powder Injection Moulding is particularly suitable for small parts with medium and large lot sizes. The process is characterized by its high yield in terms of raw material.

Powder Injection Moulding consists of three process steps:

- First, near-net-shape parts are moulded on standard injection moulding machines – the so-called green parts.
- The following debinding – the removal of the binder components necessary for the shaping process – is carried out by extraction with organic solvent or water. The moulded parts become the so-called brown parts.
- The final process step consists of sintering under high temperatures. As a result, we obtain the metal or ceramic parts that have their final geometrical and material properties and which are ready to use.

LÖMI Model Series

All LÖMI Debinding Systems can be extended on a modular basis.

Series EDA

For small numbers of injection moulded parts, the EDA model series combine debinding, vacuum drying and solvent recovery in one single unit.

Series EBA / MDA

For medium and large numbers of injection moulded parts: EBA model series with a parallelly operated solvent recovery system of MDA model series.

Series EBA-E

Debinding systems with special process chamber geometry and adapted loading trays, compatible with the sinter furnace series MIM 3000 of Elnik Systems.

Series EBA-W

Debinding systems with a water extraction process for special feedstocks. They feature a horizontal vessel in a compact housing.

Testing LÖMI Debinding Technology

Tabletop Units EBA-30 / EDA-30: for research, prototyping and small batch production

For research institutes, universities and R&D departments of industrial companies, we have developed the tabletop units LÖMI EBA-30 and EDA-30. These are also suitable for prototyping, for parts manufacturers starting with PIM or AM and for small batch production, for example in the luxury goods sector.

EDA-50LW: Solvent Debinding and Water Debinding in one single unit

The LÖMI EDA-50LW Debinding System is capable of debinding with both organic solvents and water in a single system and it is the first of its kind in the industry. It is available as a test or rental system, enabling parts manufacturers to try out new types of feedstock and/or binder systems or to optimize their existing processes by using both organic solvents and water to debind their green parts. For a later purchase of a new LÖMI Debinding System, we will customize it to the manufacturer's process based on the test results. The cost of the tests or the rental system can be credited to the new investment.

PIM SOLVENT DEBINDING SYSTEMS

LÖMI Debinding Systems for CIM parts producers

Our Solvent Debinding Systems for Ceramic Injection Moulding CIM have been optimized with regard to the requirements of parts manufacturers in the **medical, watchmaking and luxury goods industries:** to avoid an accumulation of ultra-fine particles on part surfaces, the debinding process has been modified and the loading mechanism for the parts trays in the process chamber was replaced by an abrasion-free alternative. A customized filling process was also developed to ensure that the mostly very small and lightweight parts remain in place on the parts trays during the process.

Our efforts to improve Debinding Technology for the CIM industry have been rewarded. A few years ago, one of our renowned regular customers in the watchmaking industry changed its entire previous debinding technology to LÖMI's Solvent Debinding Technology in response to ongoing technological advances in the PIM industry. Since then, the company has ordered an increasing number of CIM Debinding Systems from LÖMI. In one year alone, the company ordered as many Debinding Systems as in the previous two years combined. A total of fifteen LÖMI systems are now in operation at this customer's facility.

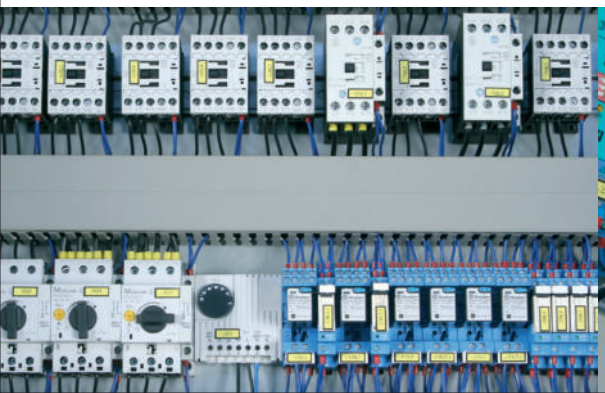
Auxiliary Equipment for PIM Debinding

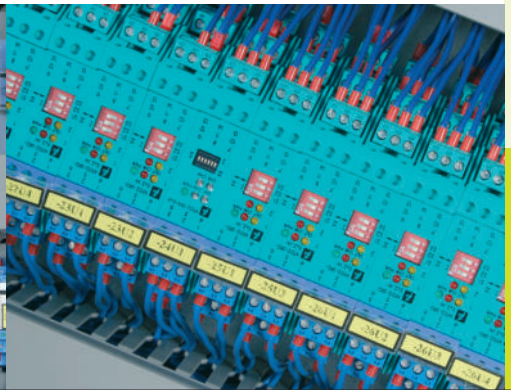
- Loading carts
- Perforated plate & wire mesh trays
- Rack systems adapted to sintering furnaces of various manufacturers
- Cleaning tools
- Collecting trays
- Tanks – optionally with:
  - Heating
  - Cooling
  - Stirring unit
  - Integration into system frame
- Cooling Systems

LÖMI Technological Edge

Our expertise and technological lead are underlined by our memberships in various committees and professional associations:

- European Powder Metallurgy Association **EPMA**
- **MIM-Expertenkreis** – under the direction of the **Fraunhofer** Institute for Manufacturing Technology and Advanced Materials **IFAM**
- German Professional Association Powder Metallurgy **FPM**





AUXILIARY EQUIPMENT

At LÖMI, we will provide you with auxiliary equipment of any kind from a single source:

- Tanks, vessels, collecting trays
- Overfill protections, level measurement devices
- Pumps, decanting systems
- Cooling or heating systems
- Columns, coalescers, demisters
- Containers and hall systems for installation of our systems

SERVICE

We offer you a personal telephone service, optionally with a **24 or 48 hour response time.**

If needed, we support you via **remote maintenance** in the operation of your LÖMI system.

Extra-long LÖMI warranty:

For our high-quality systems, you can choose to extend the **warranty period** to up to **5 years.**

YOU HAVE QUESTIONS? – WE OFFER THE SOLUTION:

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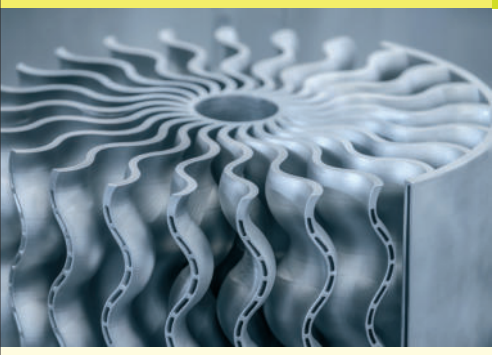

AUXILIARY EQUIPMENT FOR AM

- Loading carts
- Perforated plate & wire mesh trays
- Cleaning tools
- Collecting trays, tanks
- Cooling systems

ADDITIVE MANUFACTURING AM / INDUSTRIAL 3D PRINTING

LÖMI Debinding Systems for Additive Manufacturing AM

Additive Manufacturing (AM), also known as Industrial 3D printing or free-form fabrication, is the process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing processes, such as traditional machining.

The industrial use of Additive Manufacturing with metal powders is a rapidly growing industry that has very quickly established itself as a suitable process for producing complex metal net shape parts.

The 3D printing technology is more productive than laser beam melting and does not require a support structure. At the same time, it offers very good surface quality.

Additive manufacturing is now enabling both a design and industrial revolution, in various industries:

- Aerospace
- Automotive and transportation
- Medical, in particular for surgical implants and dental applications
- Energy
- Consumer goods

The Additive Manufacturing / 3D Printing process is an indirect two-step process:

- After a layer of powder is deposited onto a build platform, the powder is agglomerated using a binder that is fed through the printer nozzle. This step is repeated until the printing of the net shape parts is complete.
- The printed “green” part is very fragile. Its solidification takes place in a second step, during a debinding and sintering process.

Advantages of LÖMI Solvent Debinding Systems for AM

- Large number of feedstocks can be processed – for easy testing and for independence from single feedstock producers
- Debinding media: all solvents and water
- LÖMI Advanced Clean Technology, closed system
- Available with basic automation, semi-automatic or fully automatic
- Air- or water-cooled
- Ergonomic front loaders
- Optionally with integrated tanks

LÖMI EDA-AM Debinding Model Series

Our three EDA-AM Debinding Systems, which are based on well-proven technology, offer a three-in-one functionality by integrating debinding, drying of parts and solvent recovery. This saves time and costs, as no additional handling of the parts is required between the debinding and drying process steps. The integrated solvent recovery ensures a continuous supply of fresh debinding medium at all times.

LÖMI’s smallest AM Solvent Debinding System **EDA-30** is a tabletop unit with 16 liters batch loading volume for research, prototyping and small batch production. It is water-cooled and offers basic automation.

The two larger systems EDA-30AM and EDA-50 both feature integrated tanks for the clean and used debinding solvent. The **EDA-30AM** is a semi-automatic air-cooled system with 16 liters batch loading volume, while the water-cooled **EDA-50** offers 26 liters batch loading volume and full automation. It is PLC-operated, and a touch display shows real-time process parameters to facilitate process control.

All three Debinding Systems are ergonomic front loaders and can be modularly extended. A large selection of ready-to-use auxiliary equipment is available, such as standardized part trays and mobile loading carts, which save time and costs while loading the systems.

Solvent Debinding Systems for PIM and AM / Industrial 3D Printing

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Technical Specifications

AM Debinding Systems

Solvent Series EDA-AM

For Additive Manufacturing / Industrial 3D Printing

Technical Specifications

Model	EDA-30	EDA-30AM	EDA-50
Batch loading volume, width x height x depth approx.	200 x 216 x 380 mm	200 x 216 x 380 mm	225 x 231 x 500 mm
Batch loading volume approx.	16 l	16 l	26 l
Integrated tanks	No	Yes	Yes
Automation level	Basic automation	Semi-automatic	Fully automatic
Operating temperature max.	120 °C	120 °C	150 °C
Cooling medium	Water	Water or Air	Water
Marking, ATEX 2014/34/EU	Ⓔx II 2G Ex h IIA T3 Gb	Ⓔx II 2G Ex h IIA T3 Gb	Ⓔx II 2G Ex h IIA T3 Gb
Width approx.	525 mm	525 mm	695mm
Height approx.	780 mm	1620 mm	1750 mm
Depth approx.	955 mm	1105 mm	1775 mm

Technical specifications are subject to alteration and are to be considered as an orientation, since each system is engineered and manufactured specifically according to your requirements. Other sizes available on request.
All systems also available with ATEX Marking Ⓔx II 2G Ex h IIB T3 Gb or certified according to IECEx.

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MIM/CIM Debinding Systems

Solvent Series EDA

For small numbers of parts

Model	EDA-50	EDA-100	EDA-150
Batch loading volume, width x height x depth approx.	225 x 231 x 500 mm	280 x 261 x 700 mm	280 x 261 x 1000 mm
Batch loading volume approx.	26 l	51 l	73 l
Operating temperature max.	150 °C	150 °C	150 °C
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	695 mm	845 mm	845 mm
Height approx.	1750 mm	1980 mm	1980 mm
Depth approx.	1775 mm	2050 mm	2300 mm

Model	EDA-200	EDA-250
Batch loading volume, width x height x depth approx.	425 x 362 x 740 mm	425 x 362 x 850 mm
Batch loading volume approx.	114 l	131 l
Operating temperature max.	150 °C	150 °C
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	1100 mm	1100 mm
Height approx.	1980 mm	1980 mm
Depth approx.	2110 mm	2360 mm

Technical specifications are subject to alteration and are to be considered as an orientation, since each system is engineered and manufactured specifically according to your requirements. Other sizes available on request.
All systems available with ATEX Marking Ex II 2G Ex h IIB T3 Gb or certified according to IECEx.

MIM/CIM Debinding Systems

Solvent Series EBA

Model	EBA-50	EBA-150	EBA-250
Batch loading volume, width x height x depth approx.	225 x 231 x 500 mm	280 x 261 x 1000 mm	425 x 362 x 850 mm
Batch loading volume approx.	26 l	73 l	131 l
Operating temperature max.	120 °C*	120 °C*	120 °C*
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	695 mm	845 mm	1100 mm
Height approx.	1300 mm	1430 mm	1555 mm
Depth approx.	1775 mm	2300 mm	2360 mm

Model	EBA-300	EBA-450	EBA-600
Batch loading volume, width x height x depth approx.	450 x 446 x 660 mm	450 x 446 x 990 mm	610 x 524 x 900 mm
Batch loading volume approx.	132 l	199 l	288 l
Operating temperature max.	120 °C*	120 °C*	120 °C*
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	1250 mm	1250 mm	1320 mm
Height approx.	1410 mm	1410 mm	1610 mm
Depth approx.	2095 mm	2505 mm	2215 mm

Model	EBA-900	EBA-1350	EBA-2500
Batch loading volume, width x height x depth approx.	610 x 524 x 1350 mm	610 x 524 x 1800 mm	700 x 800 x 2100 mm
Batch loading volume approx.	432 l	575 l	1176 l
Operating temperature max.	120 °C	120 °C	120 °C
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	1320 mm	1320 mm	1600 mm
Height approx.	1610 mm	1610 mm	1800 mm
Depth approx.	2615 mm	3115 mm	3300 mm

Technical specifications are subject to alteration and are to be considered as an orientation, since each system is engineered and manufactured specifically according to your requirements. Other sizes available on request.
All systems available with ATEX Marking Ex II 2G Ex h IIB T3 Gb or certified according to IECEx.

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Excellence in PIM Debinding and Solvent Recovery since 1991

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Solvent Recovery Systems

Series MDA

For binder systems and other liquid residues

Model	MDA-100	MDA-200	MDA-300	M-400
Distillation rate, depending on solvent, water content and type and degree of pollution	15 - 40 l/h*	30 - 75 l/h*	40 - 100 l/h*	60 - 140 l/h*
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	845 mm	1100 mm	1950 mm	2450 mm
Height approx.	1900 mm	2000 mm	2600 mm	2510 mm
Depth approx.	1900 mm	2000 mm	950 mm	1915 mm

Model	MDA-800	MDA-1200	EBA-600	MDA-2000
Distillation rate, depending on solvent, water content and type and degree of pollution	80 - 250 l/h*	120 - 300 l/h*	270 - 450 l/h*	500 - 1100 l/h*
Marking, ATEX 2014/34/EU	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb	Ex II 2G Ex h IIA T3 Gb
Width approx.	2470 mm	3100 mm	3100 mm	3700 mm
Height approx.	3110 mm	3350 mm	3600 mm	4650 mm
Depth approx.	2065 mm	2850 mm	2850 mm	3150 mm

Technical specifications are subject to alteration and are to be considered as an orientation, since each system is engineered and manufactured specifically according to your requirements. Other sizes available on request.
All systems available with ATEX Marking Ex II 2G Ex h IIB T3 Gb or certified according to IECEx.

LÖMI WORLD-WIDE

- LÖMI locations in Germany
- Our international representations
- A selection of our customers

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