

The REMONDIS Lippe Plant. An industrial recycling centre



An industrial centre with an ideal infrastructure

The REMONDIS Lippe Plant covers an area of 230 hectares. REMONDIS has invested more than 400 million euros in the plant since taking it over in 1993 and has created an excellent infrastructure. This, in turn, enables the businesses located there to run their processing and production plants smoothly and efficiently. The plant complex provides numerous central services such as energy supply, wastewater treatment and laboratory services as well as its own plant security office and fire brigade.





Systematic recycling to prevent climate change and conserve resources

No raw material is infinite, no source of energy inexhaustible. It is precisely for these reasons that we do everything in our power to recover every type of raw material that can be fed back into the economic cycle. Moreover, we carry out systematic research work to find alternative energy concepts and sources of fuel and ensure they are implemented rigorously and effectively.

Recycling activities carried out on an industrial scale help to conserve natural resources and prevent climate change



Raw materials come from the ground. Or from the REMONDIS Lippe Plant. Being a recycling company, REMONDIS feeds several million tonnes of raw materials back into economic and production cycles around the world every year

Recycling, services and water for millions of customers. The REMONDIS Group

Since its foundation in 1934, REMONDIS has become a leading international recycling, service and water company – built up on the solid foundations of a family-run business full of tradition. The Group employs over 30,000 people – at around 500 locations in 34 countries in Europe, Africa, Asia and Australia.

Processing & production – no compromises. The REMONDIS Lippe Plant

The experts at the REMONDIS Group are continuously working on further increasing the efficiency of the technology used to recover raw materials and energy from waste. Over the last few years, several new processing and production facilities have been opened up at the REMONDIS Lippe Plant alone. They play an important role helping to conserve primary raw material and energy resources and prevent climate change – and to make the REMONDIS Lippe Plant what it is today: a global role model.



Energy can be generated from oil, gas, uranium or plutonium. Or from biomass. REMONDIS is already investing in the energy sources of the future. On an industrial scale and only of the very best quality

Saving primary raw materials and energy at the Lippe Plant

- The two power plants on the site are fired using secondary fuels and timber. As a result, the demand for primary energy sources is reduced by 130,000 tonnes each year.
- In addition, the low-energy methods used to recover raw materials and the environmentally friendly fuels used in the power plants mean that each year the amount of CO₂/CO₂ equivalents pumped into the atmosphere is cut by 260,000 tonnes.

Lippe Plant

1,100,000t raw materials +

products per year





1,600,000t residual materials each year

Each year, over 1.6 million tonnes of residual materials are treated in Lünen to produce more than 1 million tonnes of raw materials and products as well as 300,000 MWh of electricity and steam



300,000 MWh electricity + steam per year



¹⁾ Production of fuels for thermal recovery



Central location, wide range of services, industrial infrastructure

The REMONDIS Lippe Plant has an excellent on-site infrastructure as well as extremely good transport connections. The harbour on the Datteln-Hamm Canal, the numerous direct railway connections, the plant's central location within the German motorway network and its proximity to Dortmund Airport all ensure that the company and its facilities can be reached by everyone – whatever their preferred means of transport may be.

One location, four segments

	One location, lour	segments
U	Raw materials	We process waste so that it can be fed back as raw material into economic or energy cycles.
	Products	We produce high quality base materi- als, special products and industrial goods.
	Energy	We produce biodiesel as well as substi- tute fuels and run eco-friendly power plants.
	Industrial location	We offer industrial businesses, that wish to use our attractive infrastruc- ture, the space they need to realize their ideas.

> Facts & Figures	
Total area	230 ha
Production area	ca. 100 ha
Plant landfill	ca. 50 ha
Green/unused areas	ca. 80 ha
Employees	>1,400
Input amount	1,600,000 t/a
Output amount	1,000,000 t/a
Output energy generation	300,000 MWh/a
(electricity & steam)	
Investments*	ca. 400 million EUR
* as in 2013	

The REMONDIS Lippe Plant. A location with many facets











Top quality material recovery

REMONDIS works continuously towards ensuring that more and more residual waste and discarded products can be recycled – and not only so that such work is technologically possible but also so that it makes good economic sense. In Lünen – as at our other locations around Europe – we have built industrial-scale processing facilities and dismantling centres in which top quality raw materials are recovered once any hazardous substances have been carefully removed.

REMONDIS



> WASTE ELECTRICAL & ELECTRONIC EQUIPMENT (WEEE)

Recovering raw materials from waste electrical and electronic equipment

At its WEEE dismantling centre in Lünen, REMONDIS Electrorecycling operates two recycling lines – for cooling appliances as well as for small electrical devices and consumer electronics – and a dismantling line for visual display units.

REMONDIS runs a total of seven such dismantling centres across Europe

Practically all of the recycling stages at the centre are now automated. First, any hazardous substances are removed from the equipment in an environmentally friendly manner and then the appliances are dismantled using mechanical processes. This multi-stage system, with its various kinds of shredding and separation technology, generates around 100 recyclable and special materials such as plastics, metals and glass. These can all be fed back into production cycles. These excellent results show that it is also well worth counting on REMONDIS' many years of experience when it comes to dismantling WEEE.



The dismantling and shredding processes used at the dismantling centre in Lünen generate top quality raw materials separated strictly according to type

Input

cooling and freezing appliances, TVs, VDUs, small household appliances, IT equipment, consumer electronics, tools, garden equipment etc

Processes

removing hazardous substances, shredding/crushing, sorting

Output

plastics, copper, iron, non-ferrous metals, composite materials, capacitors, batteries, waste oil, CFCs, timber, panel glass

Timber recycling and the production of substitute fuels

A modern timber recycling facility is located at the REMONDIS Lippe Plant. The different types of wood treated there are used as a carbon-neutral fuel for the neighbouring biomass-fired power plant (BMK).

The old furniture and other types of discarded wood must first be processed before they may be used to generate energy at the BMK. First, any iron pieces and other unwanted materials are removed. The waste timber is then sorted, cut up, screened and separated. Around a fifth of the treated waste timber is of the right quality and of the same type so that it can be re-used to produce chipboard. This material is sent to other timber processing facilities within the company group for further treatment.

The remaining wood chips are transported to the neighbouring BMK as a carbon-neutral fuel. As there are so many ways for the timber processing facility and the BMK to cooperate, they have joined together and are run by the company Biomassekraftwerk Lünen GmbH.



The old wood treated at the timber processing facility is used as a fuel by the neighbouring biomass-fired power plant

Input

construction waste, packaging,

bulky waste, screen overflow etc

Processes

sorting, shredding, screening, separating

Output substitute fuel for the BMK

The timber recycling facilities at Lünen use high performance shredders and quality control mechanisms

	Facts & Figures – timber recycling			
	Employees	14		
	Capacity	430,000 t/a		
MONN.	Connected to	biomass-fired power		
	TET BALLAN	plant (BMK)		
	COMPANY AND ADDRESS OF	CONTRACTION OF CONTRACTORS		

High-grade steel and non-ferrous metals from slag

Slag and waste from kilns used for high-grade steel and non-ferrous metal production processes contain considerable amounts of high quality alloys. REMONDIS recovers these valuable materials at the Lippe Plant.

The processing methods result in the slag being separated into such pure fractions that the recyclable materials can be returned to the manufacturers to be used once again in the production processes. Unwanted materials are carefully removed and processed separately so that, once all hazardous substances have been removed, they can be used for building landfills and embankments.

Input metal slag, waste from kilns Processes shredding/crushing, screening Output high-grade steel and non-ferrous metal granulate, ground slag

A multi-stage process is used to treat the slag

Facts & Figures – metal slag processing

mployees	15
Capacity	250,000 t/a
Connected to	mineral recycli
	motal recycling

Facts & Fig



> EARTH

Quality earth for landscaping work

The recycling of biological materials is perhaps the most natural of all recycling activities. In-depth expertise is needed here, too, if the best possible solutions are to be found for all stages of the supply chain.

At our earthworks, we produce arable soils from earth, cleaned grit chamber contents and additional materials such as volcanic rock flour and other nutrient suppliers. Once processed, the soils have the same physical characteristics and nutrient contents as normal topsoil. They are used in landscaping as well as for planting greenery on landfills and spoil dumps. For the soils to be a source of humus, additional substrates are also used from the composting division.



The careful processing techniques are subject to regular quality controls

The earthworks is connected to the composting plant on the site

Input excavated earth, grit chamber contents, slag, sludge Processes crushing, screening, mixing Output humus soils

ALUN N°



High-quality production processes

REMONDIS has built industrial production facilities in Lünen for high quality base materials, special products and industrial goods and is continuously extending this area. When developing new ideas, priority is always given to the marketability of the potential products. The company's own secondary raw materials are primarily used to manufacture such products as well as primary raw materials – and the success of these products on the market has proven that the developers were right: ALUMIN[®], CASUL[®], PLANOLEN[®] and other brand-name products are in high demand from a wide variety of sectors all across the world – from the chemical industry, to food production, to medical technology.



 $> \mathsf{ALUMIN}^{\textcircled{B}}$

ALUMIN[®] – a special chemical for the water sector and construction chemicals

Sodium aluminate is not simply sodium aluminate. ALUMIN[®], a REMONDIS product manufactured at the Lippe Plant, clearly stands out from other similar products thanks to its high purity, its very high levels of reactivity and its very great stability.

ALUMIN[®] has been marketed successfully for many years now The processes used to treat the surfaces of aluminium parts and the production of catalytic converters result in the accumulation of solutions and sludge which contain aluminium. These substances are cleaned, concentrated and filtered by REMONDIS using a series of complex procedures. By adding a certain amount of primary raw materials, it is possible to produce varying qualities of pure ALUMIN[®]. ALUMIN[®] is a high-quality sodium aluminate with excellent product characteristics making this special chemical particularly interesting for the water branch. ALUMIN[®] is used, for example, as a flocculation agent for treating wastewater and producing drinking water. However, ALUMIN[®] is also used for construction chemicals, for producing chemicals and also to produce CASUL[®], a white mineral developed by REMONDIS.



 ${\rm ALUMIN}^{\otimes}$ is a high quality special chemical which is used, among other things, as a flocculation agent for treating wastewater and producing drinking water

Input

sodium hydroxide solutions, aluminium hydroxide, solutions containing aluminium, filter cake and sludge Processes cleaning, concentration, filtration Output ALUMIN® 7, ALUMIN® 8, ALUMIN® 10, ALUMIN® HQ

CASUL[®] – a white mineral for paint, plaster and paper

CASUL[®] is a remarkably white, synthetic mineral (ettringit) which has been developed by REMONDIS itself. The product is ecologically safe and, for many applications, enables production processes to be carried out without harmful biocides, preservatives or softeners.

Besides its high covering capacity, CASUL[®] is a highly sought-after product due to its gloss-giving qualities. CASUL[®] can be used in the following areas:

- paper industry CASUL[®] as an ingredient or mineral in coating solutions for refining the surface of high quality glossy paper for art prints as well as for food packaging
- paint industry CASUL[®] as a white mineral in dispersion paint with a high covering capacity as well as in eco-paints (paints containing CASUL[®] do not need harmful additives such as biocides and preservatives). The paints are also sold under the company's own brand, CasuBlanca
- construction chemicals CASUL[®] as a white mineral in liquid plaster



CASUL® is an extremely white mineral which is delivered in both liquid and solid form and is found in, for example, the 'Royal' liquid plaster and 'Easy-Putz' plaster produced by the company Knauf



An important raw material used to manufacture CASUL[®] is ALUMIN[®] which is also produced at the REMONDIS Lippe Plant

Input ALUMIN[®] and other high quality raw materials

Processes

patented, multi-phase process: HSDP – High Solid Dispersion Process

Output

casulwhite HSP 1[®], casulbin HSP 2[®], casulprint HSP 1[®], CasuBlanca paints, casubin 30, casul powder H1i



PLANOLEN[®] and PLANOMID[®] – plastics from waste rather than crude oil

RE PLANO produces and sells different qualities of plastic granulates and compounds under its PLANOLEN[®] and PLANOMID[®] brand names. A large amount of the granulates are produced according to individual customer specifications fulfilling particular requirements concerning function and colour.

PLANOLEN° PLANOMID°

Another plastics production plant can be found in Taipei



PLANOLEN® granulates conform to all important ISO and DIN industrial standards and provide a reliable quality. Several granulates of this brand have received the mark of quality from the RAL-GRS

PLANOLEN[®] is non-ageing, light and water-repellent; it can stand tension yet is still solid. This top quality granulate is

also very pure so that the products made from it are of a consistently high standard. PLANOLEN® is, therefore, especially suitable for extrusion and injection-moulded products, cable ducts, pipes, pallets, building products, containers, films, bags, sacks etc.

PLANOMID[®] granulates stand out thanks to their high stability, long lifespan and the fact that they are resistant to petrol, oil as well as many kinds of alcohol. PLANOMID[®] is an ideal material for products manufactured through injection-moulding processes and which have to stand high levels of use, such as components for fans, ventilation systems, switch boxes, vehicle parts, Rawlplugs and casing for electrical appliances.

Input

waste packaging, production rejects and other high quality raw materials

Production

coarse & fine shredding, metal extraction, cleaning, compounding, granulation

Output

PLANOLEN[®] and PLANOMID[®] granulates, HPDE ground material

Facts & Figures – production of PLANOLEN[®] and PLANOMID[®]

Employees	36
Capacity	27,000 t/a
Connected to	WEEE dismantlin
	centre



> CASEA

CASEA – binding agents for construction materials, dental plaster and more

Large amounts of gypsum are produced as a result of the desulfurization of flue gases at power plants fired with fossil fuels. Around 350,000 tonnes of this gypsum are processed at the REMONDIS Lippe Plant each year and turned into additives and binding agents by CASEA.

One of the main reasons determining the quality of a plaster is the choice of binding agent. CASEA produces calcium sulfate binding agents from the purest FGD gypsum – using production technology that guarantees the products have excellent properties. These binding agents fulfil the most stringent of standards, are adapted to fulfil specific application requirements and can be used to produce liquid screed and porous concrete, fertilizers and cement as well as for materials used in dentistry.





FGD gypsum from coal-fired power plants and chemical gypsum

Production calcination, grinding, mixing, refinement

Output

Raddipor, Raddipur, Raddiplus B, Raddiplus C, Radditrans, Raddisprint, Raddichem, Raddiform, Raddident, Raddident SW, Raddifood, Raddikult D



The production processes that we use to make raw materials of such consistently high quality are unique across the world – a fact which quality tests have proven

HUMERRA[®] – compost products for good soils, earth and substrates

At the REMONDIS Lippe Plant, compost is produced for landscaping and horticulture businesses, for the agricultural sector as well as for growing special crops. These high quality products are marketed under the HUMERRA® brand name.



HUMERRA® produces specific types of compost for different sectors that always fulfil the exacting requirements of the various users



HUMERRA[®] supplies a comprehensive range of different quality-assured composts including special products such as substrates and mulch. They are all produced in Lünen using the Brikollare composting method, which was developed and patented by REMONDIS. Once the biologically degradable waste has been pre-sorted and freed of unwanted materials, it is first pressed into briquettes weighing between 50 and 60 kilos and then placed in an air-conditioned highbay storage area where it decomposes at a temperature of up to 70 °C over four to six weeks. This means that each user receives exactly the right product to make their business a success.

Input plant/tree cuttings, garden and kitchen waste from households **Production** shredding, briquetting, decomposition

Output

HUMERRA® Active Compost, Green Compost, Fine Compost, Structure-Improving Compost, Wood Chippings, Humus Soil, Substrates, Asparagus Compost, Mulch, Paddock Surface Material





> ECOMOTION®

Biodiesel – energy from animal fats and used deep frying oils

Being one of the pioneers among the biodiesel producers, ecoMotion[®] uses vegetable and animal fats as well as processed deep frying oils from the restaurant trade to make the most eco-friendly and sustainable type of biodiesel currently being produced on an industrial scale.

Unlike the biofuels made from energy crops, the biodiesel produced from waste or residual materials at the Lippe Plant does not require any field space. This is an important advantage as far as its footprint is concerned but it is not the only one. Looking at the limited resources of natural crude oil, the dependency on crude oil imports and the needs of our environment, the biodiesel from Lünen has further advantages compared to mineral oil diesel:

- a reduction in hazardous emissions (lower particulate emissions, less carbon dioxide (CO₂), carbon monoxide, hydrocarbon)
- helps to conserve our fossil resources

Across Germany, ecoMotion $^{\odot}$ has the capacities to produce over 240,000 million litres of biodiesel



Compared to fossil fuels, the ecoMotion[®] biodiesel saves up to 83 percent CO₂

Leading mineral oil companies use the biodiesel to fulfil the legal blending regulations.

Input vegetable and animal fats and oils Production multi-feedstock facilities **Output** biodiesel, glycerine, fertilizer

WH HUS TEDMINE 14115/99-466 CSTBat 37-466 KTG 92/1068 1-4



Generating energy from biomass

If we wish to remain warm in the future and to carry on using our cars to get from A to B, then we need to have alternative forms of energy which are not dependent on finite fossil fuels such as coal, oil and gas. REMONDIS and its sister company, SARIA Bio-Industries, have been developing and implementing efficient, forward-looking solutions concentrating, to a great extent, on different sources of biomass. Some of our large industrial facilities are located at the REMONDIS Lippe Plant.

Biomass-fired power plant – energy from waste timber and plant cuttings

We have invested in an innovative and future-oriented market with our biomass-fired power plant (BMK), one of the most recent additions to the Lippe Plant. This facility is primarily run on waste timber and plant and tree cuttings.

The great advantage of generating electricity from biomass is the fact that economic and ecological factors have been united Old wood must first be processed before it can be used to generate electricity. This work is carried out at the timber recycling facility at the Lippe Plant. The biomass is then transported by conveyor belt from the store to a feed bunker and then on into the grate furnace. The timber burns at over 850 degrees Celsius. The hot flue gases heat up water in a water-tube boiler to create steam. This, in turn, is fed into a condensing turbine to generate electricity. Following this, cooling water is used to condense the "used" steam in a wet cooling tower. Finally, the flue gases generated as a result of the incineration process are cleaned via the flue gas system using a dry process.



The generation of electricity at the BMK is carbon-neutral; CO, emissions are, therefore, cut by 100,000t a year

Input

waste timber, plant/tree cuttings, surplus materials from the composting plant

Verfahren fuel-bed firing Output 155,000 MWh/a electricity





> PRODUCTION OF FUELS

Innovative fuel production – energy from animal raw material

The SecAnim plant in Lünen sterilizes and thermally treats abattoir waste and fallen animals. SARIA, one of REMONDIS' sister companies, officially opened the plant on the site in 2003.

By processing high risk material from animal by-products, it is possible to recover fats and to create meat paste which can be used as an alternative fuel. The fats are marketed as a primary product for manufacturing biodiesel; the sterile meat paste is sent directly to the fluidised-bed power plant on the site as a fuel. It is essential to have the most stringent of hygiene standards in place when handling animal by-products which must, of course, be adhered to at all times. To ensure the system is absolutely safe, therefore, this special process is carried out in precise, pre-determined stages – from taking samples, to cutting up and sterilising the material, to removing the fats.



SARIA's subsidiary, SecAnim, guarantees that the highest possible safety standards are implemented when disposing of high risk material from animal by-products

Input abattoir by-products and fallen animals

Production

processing and conditioning facilities

Output fuels (fat and degreased meat paste)

Fluidised-bed power plant – energy from alternative sources

REMONDIS needs its own power plant to be able to provide the production facilities at the Lippe Plant with energy – be it electricity, process steam or compressed air. The fuels used to power the plant are primarily secondary and substitute fuels.

REMONDIS supplies itself with energy from its fluidised-bed power plant



All processes at the power plant are monitored via the central control room

It is not possible for the power plant to be fired completely (i.e. 100 %) with secondary and substitute fuels due to the conditions set down in its permit. The fuels used by the fluidised-bed power plant at the Lippe Plant include, among others, the sterilized liquid meat paste from the neighbouring rendering plant which processes abattoir waste and fallen animals – a process which is unique across the whole of Europe. Furthermore, approx. 170 types of waste listed in the European Waste Catalogue can be thermally treated in the fluidised-bed power plant. This covers both solid and liquid waste.

Input

sterilized meat paste, animal meal, waste from the chemical & pharmaceutical industry, substitute fuels, sewage sludge etc Production fluidised bed combustion

Output

50,000 MWh/a electricity, 135,000 t/a steam, 55,000,000 m³/a compressed air

The power plant at the Lippe Plant supplies the site with electricity, process steam and compressed air – generated from alternative energy sources

Facts & Figures – fluidised-bed power plant

Employees	
Capacity	
Connected to	

42 215,000 t/a the whole site



And finally a quick look back

Covering a total of 230 hectares, the REMONDIS Lippe Plant is the largest industrial recycling centre in Europe. Over the last few years, REMONDIS has invested more than 400 million euros and efficiently developed the site. This has resulted in the creation of a large number of jobs: 476 people were working at the site at the time of the takeover; this has increased to more than 1,400 – and the number continues to grow.

A successful structural change, a lively history, a lively area – 2008 the most important facts & figures:

Vereinigte Aluminiumwerke (VAW)	2010
1987 Production of aluminium oxide is closed	
down, first steps to find alternative uses	2010
1993 Takeover of the site by REMONDIS – the start	
of the company's plan to set up an industrial	
recycling centre with activities in the area of	
gypsum, chemicals, wood, plastics and fuels	2010
1996 Composting plant is put into operation	
2003 The rendering plant for processing animal	
by-products into substitute energy goes into	2011
operation	
2005 New facilities for recycling plastics and	2013
producing white minerals (CASUL®) are put	
into operation 2	2013
2006 The WEEE dismantling centre, the biomass-	
fired power plant and the biodiesel production	2013
plant all go into operation	

Construction of the new Umwelt Control Labor (UCL) building for analysing and assessing materials

Construction of a new administration building next to the main head office building Investment in turbine 4 in the FBC plant – to generate electricity from surplus steam to further reduce dependency on external power supplies

2013 Renovation of diverse outer walls of the furnace buildings as a long-term maintenance measure
 1–2013 Comprehensive measures undertaken to

reduce noise levels Wastewater pipeline cleaning system is altered as part of a project to revive the River Emscher Redevelopment of the landfill's plateau including landscaping work

13–2014 Construction of a new administration building

Delegations from Eastern Europe and Asia regularly visit the REMONDIS Lippe Plant to see for themselves how a truly effective recycling system is run

Group companies located on the site

- ecoMotion[®] production of biodiesel
- REMONDIS Aqua supplying drinking water / treating wastewater
- REMONDIS Electrorecycling recycling of WEEE
- REMONDIS Industrie Service full range of services covering hazardous waste
- REMONDIS Medison recycling of photographic chemicals and hospital waste
- REMONDIS Production production of high quality raw materials, base materials and products
- RE PLANO plastics recycling / marketing
- REMEX ProTerra remediation services
- RETERRA® compost production / marketing



- SecAnim recycling of animal/vegetable products and residual materials
- UCL environmental laboratories
- WBL Wirtschaftsbetriebe Lünen
- XERVON technical services for the process industry

REMONDIS' main administration offices are also located at Lünen. It is from here that the family-owned business is run

REMONDIS® WORKING FOR THE FUTURE

REMONDIS is one of the world's largest recycling, service and water companies. The company group has more than 500 branches and associated businesses in 34 countries across Europe, Africa, Asia and Australia. With over 30,000 employees, the group serves around 30 million people as well as many thousands of companies. The highest levels of quality. Working for the future.