Effizienz-Agentur NRW

Resource Efficiency In Practice

Protect resources – Strengthen the economy

NRW.

Contents

Resource efficiency – Impulses for forward-looking management

Introduction

According to calculations by economic historians, Germany has become 17 times more productive since 1870. However, if we are talking about impressive growth we must keep in mind the price we pay for it. With this development, growth has also been achieved at the expense of natural resources, which were initially difficult and costly, but today are faster and cheaper than ever to obtain. If the real price for this substantial use of resources were reflected at the cash desk to us as consumers, we could no longer afford most of the products that are commonplace today.

What is not used does not have to be paid for.

Intelligent exploitation of resources, recycling of ingredients in production, substitution of supplies and utilities for those based on renewable raw materials – these are only a few examples of the many alternatives that would enable an increase in resource efficiency. Thus, resource-efficient management is an important key for us on the path to more sustainable development. The globally increasing costs of raw materials show that it is time to act. Achieve more with less: this rule of thumb results not only in fewer adverse effects from the extraction of raw materials, but also minimises the accumulation of pollutants and waste.

Demands on society.

These economic and environmental demands have now led to initiatives and concepts, which have met with a big response around the world. The United Nations Environment Programme (UNEP) for instance sets the reduction of resources consumption by the factor of 10 as a long-term target in its report "Global Environment Outlook 2000". In this context, the German government has defined two action targets for the year 2020 in its national sustainability strategy: increasing raw material productivity by the factor of 2.5, and doubling of energy productivity. Additionally, bundling of economic and political potentials on a regional level in the sense of a comprehensive environmental protection in North-Rhine Westphalia has been explicitly integrated in the coalition agreement.

Material and energy consumption are important criteria for the economy. Whether practicable and effective measures are developed and implemented in the context of these considerations depends primarily on the extent to which the consumption of resources is accepted as a cost factor and its reduction as a contribution to more competitive ability. Whereas many large companies are already making major efforts in this field, small and medium companies often do not have the required resources.

On the way to greater resource efficiency.

The Effizienz-Agentur NRW (EFA) was created as a central contact point for the medium-sized manufacturing businesses in North Rhine Westphalia, to support precisely these companies. It supports small and medium-sized companies in introduction of new technologies, procures external consultants on special issues, provides information on programmes and projects, arranges public financing and combines individual initiatives to form significant overall projects. Thus, for instance by application of the PIUS-Check – a consulting instrument of the EFA – about 380 projects have been started in companies and total savings of 12 million euro achieved since its introduction in 2000. PIUS is the acronym of the German "Produktionsintegrierter Umweltschutz", analog to cleaner production. Together with partners from the worlds of industry, science and politics Effizienz-Agentur NRW develops and arranges numerous methods of strengthening the resource efficiency of medium-sized companies and thus provides significant impulses – be this in design for the environment, the use of renewable raw materials or the creation of ecologically and economically sensible maintenance management – whether in the chemical, paper, textile or food industry.

With this brochure, we hope to show you the multi-layered aspects and application areas of resource-efficient processes, as well as the numerous starting points for environmentally acceptable management by means of successful examples in practice, because we know that the advantages of this new thinking can be utilised and realised not only by future generations, but also today. We look forward to being able to continue providing small and medium-sized companies in our region with decisive impulses and actively supporting them.

Warm regards,

Dr. Peter Jahns
Managing Director of Effizienz-Agentur NRW

Resource efficiency – a field that is wide-open to new ways

Methods and technologies

Measures for increasing resource efficiency are an important precondition to ensuring long-term company success at the same time as protecting the environment. The Effizienz-Agentur NRW (EFA) combines this issue with a broad specialist knowledge and long-term experience under one roof. With methods such as design for the environment and resource cost accounting, the EFA points out ways for medium-sized companies to improve their production and products or to optimise efficiency within the value added chain. Furthermore, technologies such as membrane technology and biotechnology help not only to improve resource efficiency in the companies, they are an important step towards a future-focused type of economy, securing long-term competitive advantages and relieving the environment.

Biotechnology

Maintenance

Membrane technology

Renewable raw materials

Resource cost accounting

Lubricants in sheet metal forming

Design for environment

Natural economy

Biotechnology

Biotechnological procedures are processes which modify or create material and are already used in many industries. Specific substances are created, combined, split or decomposed with high selectivity, by the targeted use of natural metabolic processes. Due to lower pressure, lower process temperature and discontinuance of the use of non-biodegradable and hazardous solvents, biotechnology is considered as a "gentle" procedure, in contrast to many mechanical or chemical processes. Resources are saved, efficiency increased, undesirable by and waste products are reduced or converted to biodegradable substances – and with considerably shorter processing times and better product quality.

TVW Textilveredlungs- und Handelsgesellschaft Windel mbH

Since 1872, different kinds of textiles such as fabric, knitwear and imitation leather have been finished to order at Windel. The methods applied here are, for example: desizing, bleaching, dyeing, finishing and coating. Today, the family-owned business employs a total of 140 staff and, in 2005, achieved a sales volume of approx. 10 million euro. Windel won the National Environment Award in 1994 and the Environment Award of the City of Bielefeld in 1996.

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The potentials

The aim of desizing is to decompose the starch layer as well as the undesirable organic substances embedded in many fabrics. As far as the process and composition of the fabric permit, Windel places emphasis on enzymatic desizing. The so-called bleach-cleanup – the enzymatic removal of bleaching agent residues – represents a second biotechnological focus. 8.5 tonnes of enzyme preparation are required per year for both processes. The costs for these enzymes are approx. 25,000 euro – a total of only 1.5% of the overall costs of production materials. The decisive factors for the use of enzymes were better biodegradability, less susceptibility to faults and lower energy consumption as well as the less aggressive nature of the materials. By using biotechnology for the bleach-cleanup, it is possible to save on an energy, time and water-intensive washing cycle at a high temperature – at the same time as reducing the quantity of wastewater. This has reduced the annual costs for this process stage by some 6 to 8%. Additionally, the next processes display a higher quality level.

The result

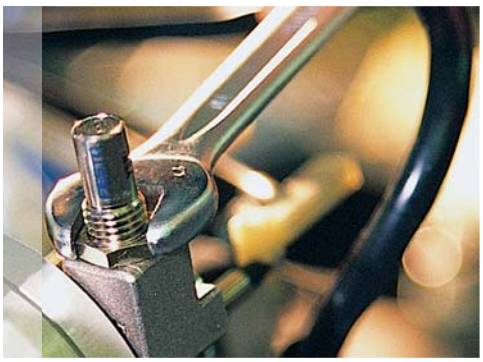
The use of enzymes has proved to be economically successful, with the processes remaining consistently controllable in terms of quality. Additionally, the process, which better preserves the fabric due to being gentler and reducing the consumption of energy, water and chemicals, has considerably reduced environmental impact. The result: better competitiveness for the company due to reduced costs. Based on the promising perspectives, Windel places great value on research and development work for further enzymatic processes.

Recently, the substitution of alkaline boiling-off in the context of cotton pre-treatment by use of pectinase has been completed. This will save, amongst other things, 80 tonnes of a 50% sodium hydroxide solution per year.

Underrated potentials for greater competitiveness

Maintenance

Whether long-term reduction of investments and operating costs or longer service life of the equipment by prognostic maintenance: professional maintenance management offers advantages that can be a decisive factor in the sustainability of a company in today's highly competitive markets. The maintenance has noticeable effects on product quality, customer retention and thus on the market position of the company.



In order for even more companies to be able to benefit from consistent planning of their maintenance processes and resources, EFA started the regional maintenance network "Märkisches Netzwerk Instandhaltung" in 2002, in the context of the regional competition "ecological efficiency in production" under the leadership of the "IFINKOR – Institut für Instandhaltung und Korrosionsschutztechnik" (Institute of Maintenance and Corrosion-Protection Engineering) in Iserlohn and the ARÖW GmbH in Duisburg. A total of twelve companies took part, from metal machining and metal processing as well as surface treatment. In the context of the initiative, IFINKOR has developed a CD-ROM with special Excel-tools, which support companies in the analysis and exploitation of their maintenance potentials. Even since the end of the competition, the toolbox has been expanded and optimised. On this basis, IFINKOR has developed a maintenance check, which was successfully applied in three pilot projects in 2005.

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Since the tradition-rich company launched its first combine harvester in 1936, CLAAS has developed into the leading European manufacturer of harvesting machines such as combines, crop choppers, agricultural balers and forage harvesting machinery. Tractors were added in 2003. At the Harsewinkel factory in Germany, some 3,000 employees produce around 4,000 large-size machines per year.

The potentials

At the end of 2005, CLAAS GmbH participated in the so-called "maintenance check" based on the strategies and tools of Effizienz-Agentur NRW. This maintenance check revealed a number of good-practice examples at CLAAS – such as for instance in the areas of documentation of maintenance-relevant data, cost input, process, target and strategy planning as well as staff motivation. However, numerous optimisation potentials were discovered in maintenance, which can make a decisive contribution to successful cost and order processing.

The result

Targets such as the optimised integration of maintenance into the management system, greater transparency for targets and strategies and improved communication with other divisions of the company will have a positive influence on the availability of production systems, when implemented. In addition to the implementation of a sustainable RFID technology, a further focal point is the analysis of failures and weak spots and thus the creation of a condition based maintenance (CBM).

Better separation – better management

Membrane technology

In many organic cell systems, metabolic separation processes are based on the use of a membrane, of which the semi-permeable separating layer allows some substances to pass while others are retained. Fields of application of membrane technology today include, for example: waste water treatment, recycling in various branches of industry, process water recycling, de-alcoholisation and filtering in the food industry, complex applications in measuring and medicine technology, and many more. Depending on particle size and molecular weight, methods such as reverse osmosis, nano-filtration or ultra-filtration are used.

Today, membrane technology has become one of the key technologies and has successfully established itself against other methods of separation such as vaporisation, ad- and absorption, chemical separation or rectification (distillation). In closed hygienic systems with relatively low energy consumption, the simple, maintenance-friendly and thus cost-effective principle can reveal all of its benefits. Thus, the purely physical separation of the substance is accomplished without chemical, biological or thermic loads, thereby not only making a valuable contribution to resource protection but also relieving the budget of the company.

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Among others, the products made by the 50 employees of the Geldern automotive, electrical and textile industry supplier include gaskets, woven guides and stampings made of vulcanised fibre – a material consisting of cotton and cellulose and which stands out for its excellent anti-static, elasticity and light weight.

The potentials

For more than ten years Vulkanfiber Krüger was looking for a more cost-effective and efficient alternative to the conventional precipitation and flocculation procedure used to treat the wastewater containing zinc chloride and accumulated during the parchmentising process before running to waste. After a first contact with the "FIW – Forschungsinstitut für Wasserwirtschaft" (Research Institute for Water Management) in Aachen at a trade fair in 1995, in the context of a study, a comparison was made between the procedures of ion exchange and membrane technology for water recycling and recovery of the recyclable zinc chloride.

The contact of FIW with Amafilter Deutschland GmbH resulted in the 2-month pilot assignment, which revealed obvious cost advantages. Since 1997, a reverse osmosis plant has been in permanent operation at Vulkanfiber Krüger, with an output of 5 m^3 volume flow per hour with 300 m^2 of membrane surface, supplemented by pre-filtration. Since then, both clean water for rinsing purposes and a high-grade zinc chloride solution are retrieved from the accumulated wastewater for the process bath.

The result

Alongside saving precipitation and flocculation agents, the requirement for zinc chloride has also reduced due to targeted recycling. Furthermore, the company has lower costs for softening the spring-water due to closure of the water cycle and thus lower consumption of process water. In addition to the smooth and low maintenance operation, over the course of time, another welcome effect came to light: contrary to initial expectations, the service life of the membranes used proved to be twice as long – with positive effects on running operating costs.

New opportunities according to proven examples

Renewable raw materials

Renewable raw materials are organic substances, which have always been used in areas such as food production, as well as in industrial processing and in the generation of heat and power. Further application fields include, for example: biodegradable lubricants and process agents based on vegetable oil, packing materials made of corn, natural fibre insulation materials and other possible applications for substances such as starch, sugar or cellulose. Renewable raw materials can already replace fossil competitors such as petroleum, natural gas and coal in many sectors, thereby making a significant contribution to the preservation of resources.

Renewable raw materials are CO_2 neutral and do not contribute to the greenhouse effect. They can be used in many different ways and are already extremely cost-effective today. They offer new alternatives for production and income in agriculture and forestry.

In conjunction with the Transfer Centre for Appropriate Technologies (TAT) in Rheine, the Effizienz-Agentur NRW specifically supported the use of these innovation potentials in the context of the regional competition "ÖkoEffizienz in der Produktion" (ecological efficiency in production) – with the regional efficiency network "Nachwachsende Rohstoffe im Betrieb" (Renewable raw materials in an enterprise), which supports small and medium-sized companies in NRW in the use of these products, in the form of a short check, free of charge; forming an access to further consulting and project work in this field.

Mönninghoff GmbH & Co. KG
Beton- und Fertigteilwerk

Mönninghoff, a company from Senden in the Münsterland region of NRW, produces concrete- and reinforced concrete prefabricated parts for the construction of sports stadia, for gardening, landscaping and conduit construction, and for the design of transport areas. Customers include municipal and city administrations, public utility companies, water suppliers and civil engineering companies.

The potentials

Five years ago Mönninghoff started conversion from the concrete separating agents used previously.

During this time, the proportion of rape oil used – produced using no chemical extraction agents – out of a total amount of parting agents used has increased by around 25%. Here, the exploitation of the parts for this application has been further developed by means of an "airmix device".

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The result

To date, Mönninghoff has purchased a total of six dosing meters and fitted further production lines with them. Its ideal parting properties, transportation with no restrictions or requirement for authorisations, the unproblematic storage and last but not least the considerable price advantage of about 30% make rape oil an ideal alternative to the parting agents used previously. Furthermore, since it is completely harmless to health and the environment, there is no risk to employees who are exposed to the atomised spray. The used rags are cleaned by an external company in a continuous process and cleaning is now significantly cheaper than for rags contaminated with mineral oil.

The best connection between business management and technology

Resource cost accounting

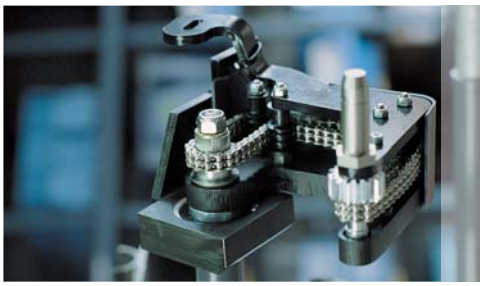
"Ressourcenkostenrechnung RKR®" (Resource cost accounting RCA) is an instrument for recording and presenting the resource-related potentials for cost reduction in a company and it enlarges the operational planning and cost accounting systems. It is based on the existing cost centre frameworks and accounting areas, links technical and business management information, allocates costs to their respective originators and analyses material and service processes as well as cause / effect correlations within a cost centre.

By means of this consistent data basis, cost drivers and optimisation potentials can be identified, control improved and resources saved. Processes can be designed with greater efficiency and productivity – for a higher added value in the company.

The Effizienz-Agentur NRW offers small and medium-sized companies a co-operation project, which shows the implementation of resource cost accounting in seven steps.

Johann Feldmann GmbH

With 18 employees, the company produces – among other things – high-grade door systems for municipal and touring buses, motor components and assembly groups, and other components for the automotive industry. Since redefinition of the company targets in 1998, the machinery facility has been expanded, staff training carried out and a new, more transparent database system implemented, which also includes the systematic integration of partners to the company. An important company target for Feldmann is the combination of quality and safety related product aspects with the greatest possible resource efficiency and environmental protection. In 2005, following successful growth, Feldmann enlarged its production facilities.



The potentials

Feldmann has developed from a pure contract producer into a system supplier for the automotive industry, with a more extensive product range and higher supply frequency. The detailed process analysis due to RCA has made a considerable contribution to the organisation of this process of adaptation and change. Whilst technical measures were initially expected at Feldmann, it soon became clear that there were convincing optimisation successes to be achieved in organisation as well.

The result

The advantages of the RCA project at Feldmann constitute not only fewer defective parts or a reduction of waste. By the fair allocation of costs according to their originators, which also serves as an important controlling instrument, it has been possible to make decisive improvements in process control and efficiency. Set-up processes have been standardised, staff awareness and thereby also long-term motivation have been raised through targeted training measures.

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New procedures – economic alternatives

Lubricants in sheet metal forming

In sheet metal processing, drawing and forming oils should avoid typical process defects such as cracks, groove formation, denting etc. and increase the service life of tools by reducing friction. However, they are also liquids with possible negative effects on the environment (water pollution) as well as on the health of employees. A special problem in the use of these oils is the large amount that has to be used due to effects such as dripping, overspray, displacement through pressure etc. The aim of responsible and efficient management must therefore be to minimise such lubricants.

In March 2004, Effizienz-Agentur NRW created the joint project "Use of high-viscosity drawing and forming oils for sheet metal forming", in order to make use of the existing cost-cutting potential for lubricants. The aim of the project was to test and evaluate the practicability of using high-viscosity drawing and forming oils in operational practice on series parts, since these special oils can be used in considerably smaller quantities than low-viscosity lubricants. DORMA-Glas GmbH also took part in the joint project – with interesting results.

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DORMA-Glas employs around 270 personnel at the Bad Salzuflen site. Globally, the glass division generated a turnover in 2004/2005 of over 90 million euro. As part of the DORMA group, DORMA-Glas develops and distributes fittings for glass worldwide. The company develops innovative products for all-glass installations and interior doors, horizontal sliding walls and structural glass.

The potentials

In the further processing of stamped blanks on hydraulic drawing presses, each part is manually moistened with deep-drawing oil (amount applied approx. 10 g/m^2). Though oil carry-over in the vicinity of the stamping machine is low, the amount of oil used is relatively high. Furthermore, external contract workers also occasionally complain of oily parts. Thus, in the scope of the joint project, in conjunction with Siegen Polytechnic, particularly problematic workpieces were lubricated in different film thicknesses with the special solid lubricant (hot-melt) Anticorit PL 39 SX from Fuchs Europe Schmierstoffe GmbH in Mannheim. As, after this coating, all parts could be finished in the ensuing grinding process, an operation test with larger quantities of approx. 15,000 units was agreed. For this, Fuchs provided the company with a prototype-coating machine including coating thickness measuring device.

The result

In the context of the test, by dispensing with subsidiary activities such as oiling and cleaning, DORMA was able to realise an average increase in productivity for deep drawing of about 30%. Furthermore, in the so-called hot-melt procedure, benefit was gained from advantages such as excellent bending properties, ungrooved and unscratched surfaces and last but not least a clean working environment: factors which both the staff and the external contract workers have rated as positive.

Added value by innovation

Design for environment

Optimisation of production can reduce costs, improve quality and benefit the environment. At no time, however, are the environmental effect and costs of a product greater than during its development. Here, the course is set for the entire life cycle – from production through use to disposal. Fewer resources, energy and emissions, the use of renewable raw materials or recycled materials, long life-expectancy and a good product capacity for repair, dismantling and recycling: by using modern technology and methods in terms of design for the environment, it is possible to minimise effects on the environment during the entire life of the product at no great additional cost.

WILO AG

With 4,170 employees (WILO-group), WILO AG realises a turnover volume of around 750 million euro. The focus of activity lies in the manufacture and distribution of energy, material and performance-optimised pumps for heating, cooling and air conditioning in building services engineering.

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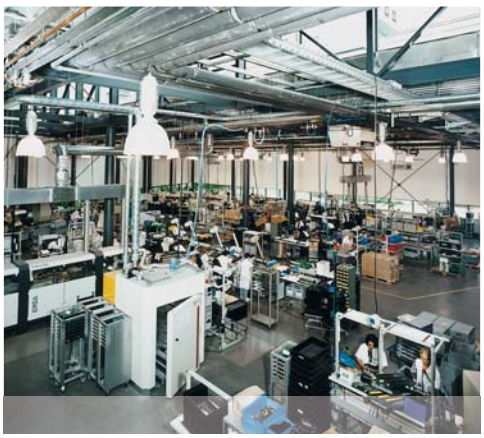
The potentials

The estimated 20 million heating pumps in German households are often overlooked as energy consumers. The millions of them in operation, however, result in enormous electricity consumption: they alone account for 10 to 12 billion kWh annually – which corresponds to around one percent of annual power consumption in Germany.

In the past, this high energy consumption has been ignored. However, to counter continually rising energy costs and to meet ecological demands, WILO AG developed the high-efficiency pump "WILO Stratos". This product is an electronically controlled heating circulation pump with a new motor concept. For the first time, an electronically commutated synchronous motor is used in a wet-running design with a permanent magnet rotor, featuring an efficiency factor that is more than twice that of standard pumps, thereby effectively reducing the drive energy.



The result

The significantly increased efficiency relative to conventional products makes "WILO Stratos" a genuine innovation. Compared with standard pumps, the "WILO Stratos" consumes up to 80% less electricity so its use by the consumer will quickly pay for itself despite its slightly higher purchase price.

The "WILO Stratos" has already been awarded several environment and efficiency prizes for energy saving and maintenance-free, low-noise operation – including the "Effizienz-Preis NRW 2001".

Competitive edge by resource efficiency

Selected industries

As a significant industrial location, North Rhine Westphalia bears a special responsibility for resource-efficient management. Nowhere else in Germany are so many tradition-rich and innovative manufacturing companies domiciled, of which the successful operating methods can serve as a model for entire markets.

Whether in the paper, food or chemical industry, each branch of production has its own special characteristics, requirements and targets to be considered when planning ecologically and economically sensible measures. The Effizienz-Agentur NRW has focused its scope of services on important key industries of NRW – each one, itself an important pillar of the local economy. Successful best-practice projects in individual enterprises prove that: what works here will advance industry as a whole.

Trade

Production and application of chemical products

Paint and lacquer industry

Food industry

Metal processing

Surface finishing

Paper industry

Textile industry

Success of all sizes

Resource efficiency in trade

Whether measures on a material, manufacturing or process engineering level, even small or medium-sized craft enterprises can now make use of convincing potentials to avoid wasting water and producing waste, as well as for low consumption of energy and raw materials. Possible approaches for this include, for example, recycling waste heat and residual materials, application of ecological raw and process materials, process variants to improve efficiency, or improved process quality through new technologies.

There are already successful practical examples for this in numerous enterprises of all different sizes. In recent years, the EFA has become increasingly involved in trade and developed methods, which help to raise resource efficiency potentials. With the "Ökoeffizienz-Check Handwerk" (Ecological Efficiency Check for Trade), since 2005, EFA has been offering an instrument that is specially tailored to the requirements of craft enterprises, with which these advantages can be used.

Rudolf Jatzke Galvanik-Hartchrom

Owner Günter Holthöfer

With 14 employees, the medium-sized electroplating enterprise, Rudolf Jatzke, in Bielefeld-Sennestadt, deals with high-quality technical hard chrome plating of workpieces, as protection against wear and corrosion – and particularly with special products made for clients from all industries. Since 1984, the company has been a member of the "Gütegemeinschaft Galvanotechnik" (Electroplating Quality Association). At Jatzke there is a great awareness that an industry such as electroplating, with such a high demand for fresh water and such heavy wastewater contamination, must – alongside its operational results – also meet its great responsibility for the environment.

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The potentials

During the chromium plating process, the electrolyte is contaminated by metal cations, which have a negative effect on application quality and make continuous cleaning necessary. The cation-exchange procedure used previously is ecologically and economically unattractive due to its high costs and the large amount of heavy metal-contaminated wastewater. In conjunction with the University of Paderborn and "Bundesstiftung Umwelt" (German Environmental Foundation), Jatzke has developed a less polluting method: electro-dialysis. Now the working baths are cleaned on-site, by removal and super-oxidation of the extrinsic ions, resulting in theoretically endless service life for the baths. The pollutants removed are electrolytically separated and recycled. Citric acid in conjunction with potassium hydroxide serves as auxiliary electrolyte – ecologically harmless substances, which moreover result in considerable improvement of the established electro-dialysis method.

The result

For the company, the benefits of this system, which can be implemented by the whole metal machining and processing industry, are obvious: there is no formation of sludge with a heavy metal content and of which disposal is difficult. Thus, Jatzke not only benefits from an annual reduction of operating costs amounting to around 45,000 euro, but also from a chemical consumption that is reduced by 25,000 kg. 10,000 l of sulphuric acid have been replaced by 750 l of harmless citric acid. Also the water consumption was reduced by 28,000 m^3, thanks to a cooling system.

As a consequence of this innovation the company won the 2nd prize at the Environmental Protection Awards of Trade in NRW both in 1995 and 1998 and achieved the first prize of the "Effizienz-Preis NRW" in the year 2000. The regeneration of chrome baths, chromating and pickling was promoted by the German Environmental Foundation.

The chemistry is right

Resource efficiency in production and application of chemical products

Chemical products play an important role in many production processes, although their application seldom ranks among the core competences of the processing companies. The Effizienz-Agentur NRW commissioned engineering consultants LEOMA from Hattingen to carry out a feasibility study, to investigate the scope of influence of close networking between manufacturer and user with respect to resource efficiency, costs and quality of a production process and what kind of improvement potentials in terms of cleaner production were still dormant at the interfaces of the value added chain.

The main focuses of the study were the value added chains "Greasing and Degreasing" and "Industrial Gluing". Here, PIUS targets measures, with which – as a result of the study – environmental pollution will be avoided and resources preserved.

As a result, potentials savings averaging approx. 15,000 euro per year were identified for the processes of degreasing and companies investigated, and approx. 6,000 euro per year for gluing processes and companies. These cost savings can be achieved by optimised co-ordination between the manufacturer of chemical products and the processor.

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The Siegener Verzinkerei Holding GmbH (SHV) group of companies with six subsidiaries in Germany and four holding companies in Eastern Europe is currently one of the largest representatives of the galvanising industry in Europe. A holding in the Dutch galvanising group, NedCoat B.V., was added in 2001, which – excluding five companies in the Netherlands and one Belgian location – maintains further holding companies. The Siegener Verzinkerei site in Kreuztal has existed since 1981, starting with a galvanising plant in the normal temperature range and since 1990 also with a second plant for high-temperature galvanising.

The potentials

Previously, the degreasing used was applied as a standard product, such that no possible individual adjustment was carried out. This promoted the carry-over of oils into the next pre-treatment baths, thereby adversely affecting degreasing performance. Furthermore this circumstance resulted in increased zinc consumption and maintenance expense in the area of the filter installation. This extra work can be avoided with product-specific and above all regular monitoring in close co-operation with the manufacturer of the degreasing chemicals in the context of a service agreement. A trial in another galvanising plant showed that the service life of the degreasing equipment can be doubled and oil saturation avoided. This "modular system" is now to be introduced in other galvanising plants.

The result

Although precise results will only be available after completion of practical tests, the following estimates may clarify the magnitude of the potential savings. A reduction of around 16 tonnes degreasing bath to be disposed of, 2.5 tonnes zinc used and a significant reduction in zinc ash are expected. The annual additional outlay for feeding an adapted emulsifier, caring for the degreasing equipment and regular bath maintenance comes to around 9,000 euro per year. Against this, there would be a total saving of displaced grease amounting to 16,000 euro. Thus in total, there would be an annual saving of approx. 7,000 euro. The company is currently examining the basic conditions for realisation of this measure, in conjunction with Effizienz-Agentur NRW.

Bright prospects for manufacturers and processors

Resource efficiency in the paint and lacquer industry

In order for medium-sized paint and lacquer manufacturers and processors in NRW to be able to benefit from previously unknown potentials for process and product optimisation, the EFA commissioned bregau olt GmbH in Bremen to carry out a potential analysis for this industry sector. The main results of the study were expressed in terms of methods of resolution for a total of five sectors: conversion to solvent-reduced paint and lacquer systems, reduction of solvent emissions with conventional paints, reduction of waste, reduction of water and wastewater amounts, as well as the avoidance of noise by preventive measures. For the Bielefeld painter Uffmann the analysis showed a series of results that proved to be decisive for the future work of the company.

Uffmann Lackierbetrieb GmbH

Uffmann Lackierbetrieb GmbH
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The company, founded in 1972, specialises primarily in contract painting of plastic and aluminium parts (household and electrical appliances). Employing 45 staff and up to 25 freelancers, coating is accomplished solely by wet painting in the HVLP, airless and airmix procedures. A quality management system based on DIN EN ISO 9001 also meets the requirements of QS-9000/98 and VDA 6.1/96.

The potentials

Based on initial tests for application of water-based paints and lacquers and originally motivated by the awareness that the company would be subject to the VOC guideline in the future, precise implementation strategies were prepared. The spotlight was particularly turned on low-loss spray methods and the optimisation of rinse and cleaning processes.

Over the years, the company has succeeded in increasing the proportion of water-based paints and lacquers to its current 60%. In co-operation between component and paint manufacturers, for example, special solutions have been formulated to solve the problems of water-based paints and lacquers on substrate wetting of plastic parts. Extremely clean surfaces without coatings, dirt etc. are already produced by injection moulding, blown off with ionised air at the casting machine and packaged immediately. The paint manufacturer was able to compensate for the remaining variations in surface quality by modification of the recipe. The very different properties of the various hydro-lacquer systems with regard to drying behaviour and temperature sensitivity have been compensated for with modifications to the existing drying zones and temperatures. Currently, around 15 to 20 minutes are sufficient for all basic lacquers. Existing spray technology has initially remained in use. The purchase of a 2-K-mixing plant later required an investment sum of approx. 50,000 euro.

The result

Based on the potential analysis, a centrifuge for lacquer sludge dehydration now reduces the percentage of water from about 60% to 10 to 30%. Due to separate drainage of clear coat sludges (top coat) and basis lacquer sludges, it is no longer necessary to dispose of the clear coat sludge. The savings as a result of using the centrifuge come to around 17,000 euro per year, with investment costs of only 7,500 euro. The company was able to reduce overspray by 15 to 20%, by conversion to HVLP spray technology. Here, the company benefits from the rapid technical development in spray devices and close co-operation with the lacquer supplier, who modifies the ingredients depending on the requirement. Observing the operational pressures required for the spray guns, the investment of approximately 8,000 euros pays for itself within only three months.

Great potentials for sensitive products

Resource efficiency in the food industry

High demands for product quality, increased productivity as a result of global competition, and growing automation form the framework of the food industry, which also has to meet strict guidelines for product and production hygiene. In particular, regular cleaning and cooling of the storage and production rooms, thermal preservation and miscellaneous cooking and baking processes result in a relatively high consumption of water and energy.

The EFA investigated the cleaner production potentials of the industry sector in a study and identified in six best-practice examples of how resource efficiency can be increased in the industry.

Schröer Eis GmbH

The 200 employees of the ice cream manufacturer currently generate sales of approx. 50 million euro per year. Founded in 1938, the company produces a wide range of stick, wafer and cone, boxed and diet ice creams. After storage, the ingredients are fed into the largely automated production line. Depending on the recipe, they are firstly mixed, homogenised, pasteurised and stored in holding tanks to mature. The next stop is the freezer. Next, the ice cream produced is shaped in an automated installation, refined (e.g. by chocolate coating), hardened by further cooling to -18°C, packaged and stored for transport.

The potentials

Transport within the production process is based on pipelines, which must be rinsed with drinking water on each product change or after preparation of a batch, since pig-clearing is not possible due to the internal fittings. Thus, in confined spaces, re-mixing of ice cream mixes and water may occur. Pipeline rinsing was previously carried out semi-automatically, with strictly prescribed rinsing quantities. Since 2002, Schröer Eis has benefited from an innovative system which records this separation phase optically by means of turbidity sensors and ensures a corresponding valve control in the pipeline. Thus the ice cream mix in the pipeline can be used almost entirely for production. As soon as the turbidity falls below a given value, the water for rinsing is drained. On restarting the installation, the water for rinsing the pipeline is now ejected into the canalisation by the following ice cream mix, until a given limit value is exceeded. The control valve will then be reset to route the ice cream mix into the production plant. These automated processes have been integrated into the existing operational data collection system and into the computer-aided system control (SPS).

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The result

By this separation-phase management in connection with optical turbidity sensors, not only was the rinsing loss significantly reduced, higher product reliability with respect to customer requirements as to the minimum content of ingredients was also obtained. Along with simplified operation of the installation, this method also brought considerable savings. Thus, with substantially less wastage of ice cream mixture, the contamination of wastewater was significantly reduced. Also the amount of water for rinsing can now be determined exactly, thanks to the turbidity sensors. The largest potential for optimisation, however, is in better exploitation of the raw materials used, which can be completely used on ejection from the pipeline or detected on start-up of the installation and integrated back into the production process. At a relatively low investment, operation and maintenance costs and an amortisation period of only quarter of a year, the system generates total savings of approx. 80,000 euro per annum.

More efficient process design

Resource efficiency in metal processing

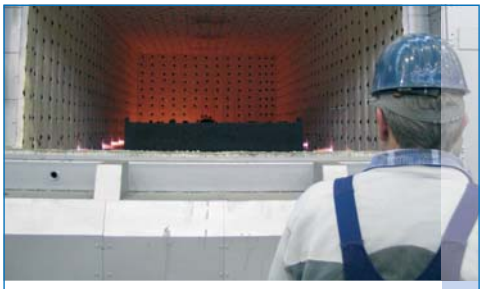
With 289,000 employees and an annual turnover of around 51,000 million euro, the North Rhine Westphalian metal industry is strongly characterised by medium-sized structures.

The resource-intensive processes in metal processing and machining contain great potential for increasing efficiency and thereby also competitiveness.

The total of 60 PIUS-Checks already carried out by the EFA prove that these potentials can be realised in this sector: approximately 20% of all PIUS-Checks have been and are carried out in metal industry businesses.

Karl Buch Walzengießerei GmbH & Co.

The Karl Buch roller foundry was founded in 1855. Using state-of-the-art metallurgy processes for casting, heat treatment, machining as well as for inspection and measuring, the company produces cast rolls for the steel, rubber, plastics and paper industries as well as roll covers and rings for the brick industry. Together with GWU mbH, Effizienz-Agentur NRW carried out a PIUS-Check in the business.



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The potentials

In conjunction with furnace builder Löcher Industrieofen- und Apparatebau GmbH from Hilchenbach, the participants found a solution with a temperature-stable heat treatment furnace to optimise the complex heat treatment of the raw rolls after casting and before mechanical treatment and minimise carbon dioxide emissions.

After a construction period of only six months, the furnace was put into operation in December 2004. The core of the innovation is a reduction of temperature variations on the surface of the annealed objects during the entire annealing process. This challenging target of a temperature constancy of +/- 2.5°C in a gas-heated furnace could only be achieved by a new furnace regulation system and a combination of pulse and flat-flame burners. In addition to the high temperature accuracy, quicker heating and a strong circulation effect of the furnace atmosphere were achieved.

The result

With improved quality, the carbon dioxide emissions inevitably caused by the annealing process are reduced by approx. 25% per year. Together with the EFA, possibilities for public funding to support this project were examined in advance. A detailed financing recommendation was then prepared for the company. Contact with the "Bundesumweltamt" (Federal Environmental Agency) was established via the environmental alliance with the KfW Banking Group, which has been in existence since the middle of 2000.

For the use of the innovative installation, the medium-sized company was awarded a grant of 30% by the KfW Förderbank, which was in charge of the administrative and political assistance of the project in terms of funding, from the "Programme for promotion of demonstration projects" of the Federal Ministry for the Environment, Nature Conservation and nuclear safety. The specialists of the EFA were available for advice in the application for the subsidies and during the approval process. In 2005, Karl Buch was awarded the "Effizienz Preis NRW" in the production category, for his innovative annealing furnace.

In-depth planning

Resource efficiency in surface finishing

Almost 26% of German production of surface finishing comes from North Rhine Westphalia, mostly from medium-sized companies. Thus NRW is the strongest location of the industry in Germany.

And almost no other industry is so water and chemical intensive: in particular here, saving important resources makes sense both economically and ecologically. Due to the industry processes and structures, the Effizienz-Agentur NRW founded the project forum "Surface Finishing" which has around 15 co-operation partners.

The aim is to make the benefits achieved here available to the whole industrial sector.

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The company was founded in 1937 and remains a family-owned enterprise to this day. Located in Wickede, near Dortmund, with over 200 employees Hillebrand produces metal components – e.g. for the automotive, construction and electrical industries – which are premium-coated using one of several methods.

The potentials

The company initially used the EFA know-how of public funding and invested in the installation of a new zinc-nickel coating system with membrane technology with the result that now only 50 m^3 wastewater per month from vacuum distillation have to be disposed as concentrate. Savings: 35% of chemical costs, 45% of energy costs, 20% of entire operational wastewater quantity – even pollution by exhaust air and noise have been considerably reduced. A low-interest loan from the NRW support programme "Initiative ökologische und nachhaltige Wasserwirtschaft in NRW" contributed to financing this project with a subsidy amounting to 20% of the 10 million euro investment.

Also, a new online analytics with X-ray fluorescence spectrometry with wavelength dispersion (WD-RFA) in the membrane-electrolysis baths has reduced the costs of chemicals in this sector by 30% – with improved surface and plating quality. The application for this measure was supported by public funding from the EFA and half of the finance provided by the "Initiative ökologische und nachhaltige Wasserwirtschaft in NRW".

The result

New marketable plating systems, savings in chemicals, water and disposal, improved product quality, 45 new jobs: the success of these projects encouraged the company to make further investments in innovative and resource-efficient measures.

The follow-up projects have included the purchase of three more WD-RFA devices, which were installed based on the favourable experiences with the online-analytics. With the impressive resource savings through the highly efficient innovations, the family-owned company is now ideally prepared for future competition.

Success factors in black and white

Resource efficiency in the paper industry

The paper industry in Germany is the no. 1 in Europe. With a turnover of around 13,000 million euro and annual production of over 20 million tonnes, a total of 3,000 different types of paper are produced. The industry in Germany employs a staff of some 46,000 at around 200 production locations.

At almost 4 million tonnes, NRW is the leading federal state in terms of production. The predominantly medium-sized structure of the North Rhine Westphalian paper industry offers many starting points for saving resources – particularly in the three core sectors of water, energy and residuals. Based on a study of cleaner production potentials in the paper industry, the EFA has developed numerous approaches for practical application.

In order to strengthen the exchange on resource efficiency strategies within the industry, the EFA created the Paper-Info-Forum in 2003, which has become established as a platform for the paper industry in North Rhine Westphalia.

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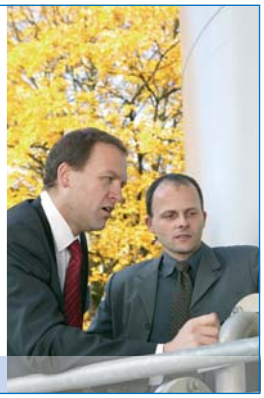

The company, Julius Schulte, produces paper, card and paperboard from waste paper. Here, it specialises in high-grade special products for niche markets. The Düsseldorf company has always focused on an ecological orientation of all processes and products. Thus, for example, a closed-circuit water circulation and wastewater treatment plant was developed and installed by the company, which may serve as a pilot project for sections of the industry. The company was awarded the "Effizienz Preis NRW" in 2003 in the production category, for its biological circuitry.

The potentials

Wastewater treatment is carried out by a procedure, which is so far unique in the paper industry. In co-operation with the Dutch constructor Paques Water Systems and the Technical University of Darmstadt, a circulation water treatment plant with three reactors was developed at Schulte. The contaminated water is initially fermented and cleaned without air in a special tower-reactor, it is then decalcified in two ventilation reactors. The biogas produced in the fermentation covers the energy demands of the plant.

The result

With a total investment of approx. 1.5 million euro, the method saves resources, costs and will soon even supply new energy by the exploitation of biogas. Thus, 260,000 m^3 wastewater and 400,000 euro sewage charges are saved annually. Furthermore, no additional chemicals are required for cleaning, and unpleasant odours are avoided – an important criterion due to the location of the company in a residential area. The PIUS-Check by the EFA, which was applied here, suggested further potential savings by optimisation of the system temperature, which is currently being investigated.

Basic material for better results

Resource efficiency in the textile industry

In North Rhine Westphalia, there are almost 300 textile businesses, with around 28,000 employees. Additionally, there are 140 more companies in the clothing industry with over 16,000 staff. The industry is undergoing drastic structural change. Resource saving in production processes, reducing costs and increasing competitiveness: these chances and opportunities can be developed by targeted measures for more resource efficiency.

The EFA informs and supports – among other ways, in conjunction with the "ZiTex – Zukunftsinitiative Textil NRW" (Initiative for the Future of Textiles in NRW) – small and medium-sized companies in the textile industry, in the exploitation of clear production potentials.

EFA activity in this industrial sector is based on a study of cleaner production potentials in the Westphalian textile industry, carried out in collaboration with the industry association "Verband der Nordwestdeutschen Textil- und Bekleidungsindustrie e.V.", within the scope of the EFA-regional competition "ÖkoEffizienz in der Produktion" (Ecological efficiency in Production). 17 companies took part in this.

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Setex Textil GmbH, founded in 1990, has 175 employees and produces bed linen, soft furnishings as well as drapery, decorative fabrics and contract textiles – including e.g. mattress covers or surgical cloths. In this, the company relies on modern, efficient production methods, which minimise the use of expensive raw materials and energy as well as discharge of industry-typical pollutants. At Setex, the automatic sizing installation is an important element for saving valuable resources.

The potentials

Before weaving, the warp threads of the yarn are smoothered with an aqueous solution – the sizing – so that the yarn will not roughen and break during the weaving process. For sizing on conventional installations, high rates of application are used. In 2001, Setex purchased a new fully automated finishing installation with a pre-wetting mechanism. In this process the yarn is firstly wetted with hot water, to swell the cotton yarn with water from inside. The water is then squeezed out again under pressure. When the sizing medium is then applied, only a small amount of it will penetrate the wet interior of the yarn. The size remains on the surface of the yarn – exactly where it is needed.

Thus, consumption of size is reduced by 20 to 30% with considerably improved effectiveness. This also results in a significant reduction of wastewater contamination for Setex and other textile refiners who use the sizing machine for contract orders.

The result

By using the pre-wetting technology costing 100,000 euro, consumption of size is reduced by 20%. This means a material saving of 50 tonnes, to the value of 40,000 to 50,000 euro per year, so the measure has paid for itself within three years at most. The new sizing machine also has insulated drying chambers so that 20% less energy is used for drying the wet-sized warp threads. Cotton dust arising in the raising plant will be pressed and subsequently recycled in a paper mill. Furthermore, waste heat from the sanforising plant is used for heating storage facilities.

Take the first step towards resource-efficient management!

Effizienz-Agentur NRW: range and location

Resource-efficient management is a profitable strategy for environment and economy – this is demonstrated not least by the practical examples in this brochure. The potentials for improvement of company-internal processes are often not instantly recognised. The Effizienz-Agentur NRW therefore introduces these potentials, particularly to small and medium-sized companies, in a number of different ways. With its toolbox, the EFA offers access to all important areas of value added – for production, product design, cost accounting and financing. The EFA informs companies in NRW by discussions, studies or jointly with partners on the many technologies, approaches and methods resulting in more efficient management and thus encourages innovations in North Rhine Westphalia and beyond.

Effizienz-Agentur NRW

North Rhine Westphalia

Increasing resource efficiency with cleaner production

Effizienz-Agentur NRW

The Effizienz-Agentur NRW in Duisburg (EFA) is the central point of contact for all small and medium-sized production businesses in North Rhine-Westphalia, for all queries regarding cleaner production and resource efficiency. Its mission is far-reaching strategic and technological improvement in the context of resource efficiency – through new strategies, innovative technologies and ecologically oriented measures.

Since it was founded, on the initiative of the North Rhine-Westphalia Ministry for Environment in 1998, the EFA has continuously and successfully enlarged its range of support. A total of 18 EFA employees are based in Duisburg and the four regional offices in Aachen, Bielefeld, Münster and Siegen, with the objective that as many small and medium-sized companies as possible will protect the environment by resource-efficient management methods and furthermore will be able to achieve sustained benefits from financial advantages.

Today, the Effizienz-Agentur NRW is not only a competent and reliable contact on the road to greater resource efficiency for medium-sized companies, but also an effective interface between industry, science, politics, media and the public.

Partners for innovation and growth

As a constant for optimum knowledge transfer and target-oriented project activities, the EFA initiates and supports co-operation of developers, providers, supporters and users of future-oriented innovations – so more and more products and services in all sectors and fields of modern industry can develop, breaking new ground in terms of environmental compatibility and efficiency – and be successful even in international markets for precisely these reasons.

The EFA is the initiator and agent of a new kind of management. New concepts and projects are continuously developed under its co-ordination – and, moreover, an efficient information network for all medium-sized businesses in NRW. With innovative procedures, the environment can be relieved and the progress of the companies in the market ensured.

The EFA-Toolbox

Together with partners from industry, science and politics, Effizienz-Agentur NRW develops numerous instruments for enhancing resource efficiency. Since the year 2000, over 500 projects have been initiated with small and medium-sized companies. Thus, for example, since the introduction of the PIUS-Check – a process oriented material flow analysis – in 2000, over 380 projects have been started in companies and total savings of 12 million euro identified.

With its toolbox, the EFA covers all important areas of value added: production, product design, costing and financing.

The EFA-Toolbox at a glance

PIUS® *Check*

Process-oriented material flow analysis for the formulation and implementation of resource efficiency measures.

Ökoeffizienz *Check* Handwerk

Instrument for optimising the use of operational resources in trade.

JUMP *Tool*

Instrument for optimising the product development process in terms of design for environment.

RKR®

Business management instrument for identifying resource-related cost reduction potentials.

EFA public funding shows the way to attractive financing possibilities for the realisation of measures designed to enhance resource efficiency.

Publications of the Effizienz-Agentur NRW

The Effizienz-Agentur NRW has documented the many aspects and results of its work in numerous publications. Further brochures and more information material on resource-efficient management can be ordered or downloaded from www.efanrw.de.

North Rhine Westphalia

A strong location in Germany

With more than 18 million residents, North Rhine Westphalia (NRW) is the most highly populated and economically the strongest federal state in Germany. Thus NRW plays an important role both in Germany and in Europe.

The location NRW, with the state capital of Düsseldorf, has the advantage of numerous favourable factors. These include its central location in Europe, the excellent infrastructure and the level of qualification of the work force. This forms the basis for the success of the federal state, which is influenced both by big concerns and efficient medium-sized businesses. The NRW economy has overcome an enormous structural change in the past three decades: from being the former centre of German heavy industry to a location with a future and a well-balanced mix of industries and service providers. Major industries include the metal, chemical and food industries.

North Rhine Westphalia is Germany's no.1 investment location. Almost a quarter of all the foreign companies doing business in Germany are domiciled in NRW.

Export world champions

If NRW were a country on its own, it would rank in 15th place among the economically most powerful countries in the world – ahead of Russia and the Netherlands. Economically, with a gross domestic product (GDP) of around 481 billion euro in the year 2004, NRW is Germany's most successful federal state. It achieved almost five percent of the economic output of the whole EU.

NRW is the German export champion: in 2004, the state exported goods to the value of 134 billion euro Thus, NRW would theoretically rank in 17th place among exporting countries globally. At the same time, the state is one of the greatest regional markets in Germany: its import volume was 138 billion euro in 2004.

Large companies are a supporting pillar of the economy of NRW: 23 of the 50 best-selling German companies have their headquarters in NRW – including groups such as Bayer, Bertelsmann and Thyssen-Krupp. At the same time, the economy of the state is strongly influenced by medium-sized businesses: around 723,000 small and medium-sized companies operate in NRW. The state also offers favourable conditions for start-ups: around 20,000 new companies are incorporated in NRW per year.

High-tech, world-class location

NRW is a high-tech, world-class location. Hardly any other region in Europe offers such a highly developed research landscape: it includes 58 universities, 13 Fraunhofer-institutes, 11 Max-Planck-institutes, 63 technology and incorporation centres as well as 30 technology-transfer centres.

Effizienz-Agentur NRW

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