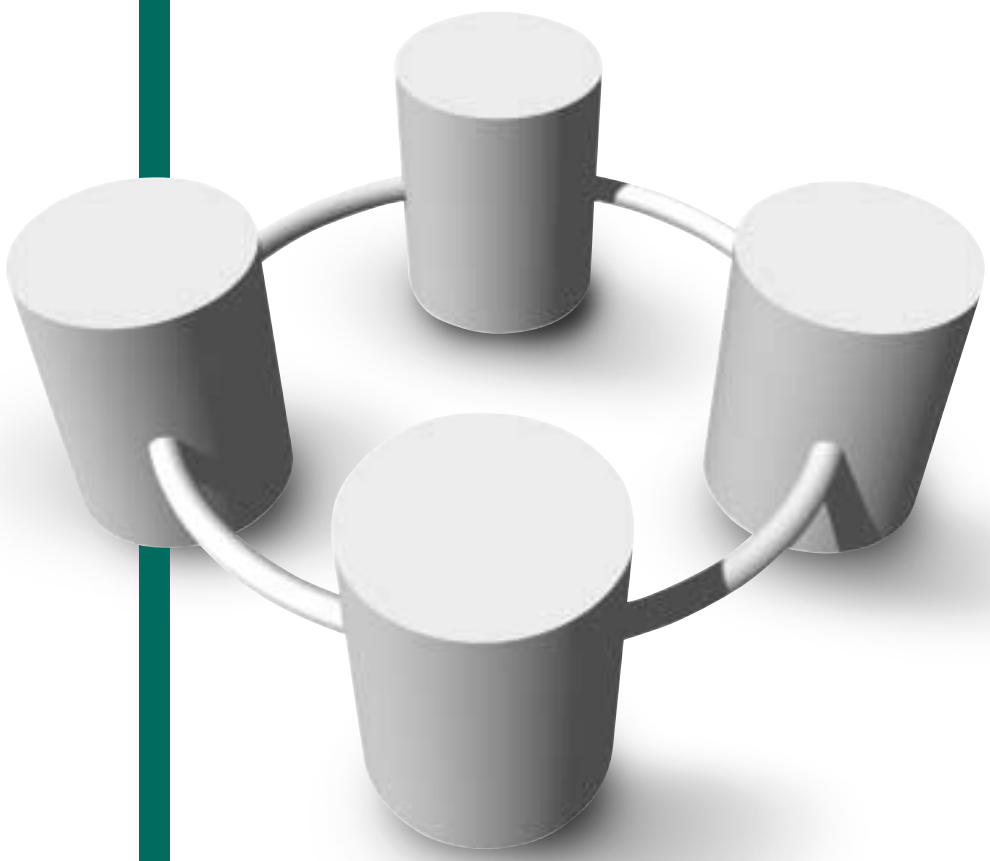
RECYCLEAN SYSTEMS | MEMBER OF GIMECO GROUP

Biotechnology for surface treatment

Hot-dip galvanizing

Closed cycle system with biological degreasing, pickling, flux regeneration and air cleaning



A biotechnology company with the whole world as its customers

Recyclean develops and markets chemicals, products and processes that operate in closed systems to prepare surfaces for various treatments. The company directs its activities to the business areas:
- hot galvanizing
- galvanic degreasing
- industrial degreasing.

Recyclean's products and processes have unique properties, which bring considerable customer satisfaction in the form of sizeable savings and higher production quality. At the same time, the Recyclean system gives total control of all of the environmental problems involved, and provides economical recycling of production chemicals.

We have customers all over the world, and the total market potential for plants and products in the surface treatment industry is estimated to be nearly 50 billion SEK. The company's objective is to become one of the world leaders in the field, by developing and updating the processes used.

New, revolutionary technology for hot-dip galvanizing

One of the biggest markets for Recyclean's products is hot galvanizing. The method used to cover steel surfaces with zinc is essentially the same as it was 150 years ago. Recyclean's groundbreaking new method currently has no known competitor on the world market. There are some alternative systems but they involve considerable additional costs for the operator, due to the quantity of waste that has to be dealt with and the greater consumption of surface zinc. Recyclean's closed system uses biological degreasing, a method that is the subject of intensive research in many countries, and in which Recyclean occupies a leading position, with a technology that is already operating. An investment in Recyclean's hot galvanizing technology normally allows the customer to recover the cost within one year and creates a completely new market position, with higher production quality at considerably lower cost. As an extra bonus, the method solves the environmental problems for staff, waste management and discharges that have always been a characteristic of hot-dip galvanizing.

Hot galvanising has been done in the same way for 150 years, in a complicated and dirty process...

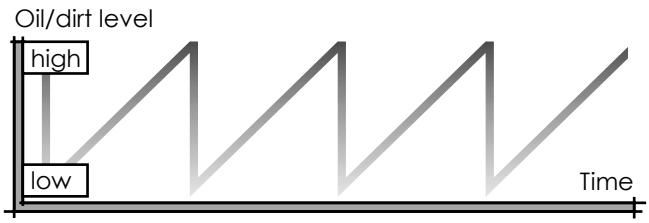
...it can now be done in a closed cycle system, free from environmental problems, with recycling of chemicals, better quality, quicker throughput time, less consumption of zinc, and as a result, better profitability.

BDS Biological degreasing

Recyclean BDS is used to effectively degrease and clean various types of metal surfaces, e.g. for hot galvanizing, phosphate pretreatment, painting or electroplating. BDS can also be used with electrolytic degreasing. The BDS process is based on a solvent-free, water-based degreasing agent for metals, RecyBact, which replaces alkali, trichlorethylene and hydrocarbon-based solvents.

The system works at a temperature of approximately 40°C, so is very energy-efficient. The bacteria break down the oil, and the more oil that is put in, the more active and numerous the bacteria become. BioSys Power 2550 containsspecial constituents that give the optimum conditions for bacterial growth. The bacteria can double in numberevery 20 minutes if "food" is available. In this way therecan be a large-scale reduction of oil, even if large quanti-ties of grease and oil are added. Oil and grease levels onthe items being treated can be brought as low as 100 to500 mg/l, so transfer of contaminants to subsequent sta-ges in the process is minimal.

The sludge that is removed contains only small amounts of oil and grease. This means that it should be possible to discharge it into the public sewerage system, or alternatively dump it. The constituents have been chosen so problems don't arise with different combinations in the subsequent rinsing bath, which might have to be emptied into your own treatment plant. The composition and condition of the bath are determined by analysis and measurement of the degreasing capacity, in accordance with accompanying instructions or by the condition of the bath being established by tests that are sent to our service laboratory. BDS works in a cycle, which is why quality can be maintained at a constantly high level. The method considerably reduces the degreasing time, and in most surface treatment processes doesn't require a subsequent rinsing stage. A well-managed bath can last for up to ten years without needing to be changed. In combination with Recyclean's effective rotary lamella separator, BDS provides an environmentally friendly degreasing system with continuous high bath quality.



Degreasing in the traditional way gives an irregular process between new start and necessary dumping.

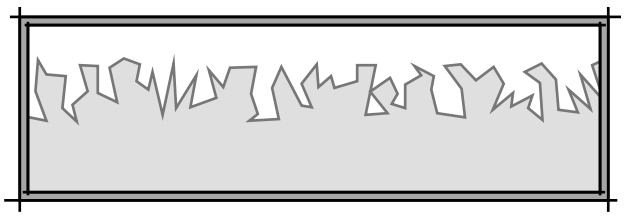
The bacterial method gives continuous, even cleaning, which means less trouble and better results

FRE Flux regeneration

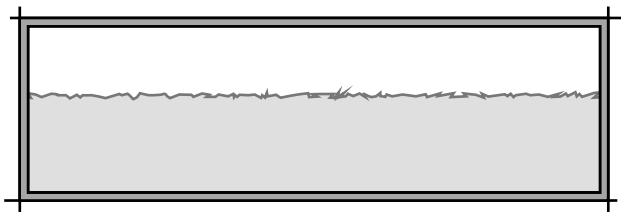
When you use the normal "dry process" for hot galvanizing, iron is always deposited in the flux bath. The goods bring acid with them from the pickling process to the flux process. The transferred iron reacts with the zinc in the zinc pot and forms hard zinc. Every iron particle binds up 25 zinc particles. This means an unwelcome expense because this "slag" leads to increased consumption of zinc.

Recyclean FRE is a new but well-tested system for flux regeneration, which constantly keeps the flux bath free from iron. At the same time, the flux bath is automatically maintained with the correct amount of flux salts. The system is based on the fact that iron is precipitated out at the same time as chloride ions, which are drawn over from the pickling baths, can react with added ammonia, forming ammonium chloride. Exhausted pickling baths provide a source of raw material for supplying the flux bath with zinc chloride. The precipitated iron is separated in a special separator, and is filtered in a filter press. The technology has been well tested, and there are many reference plants in Europe.

- Creates flux from something that would otherwise be a waste product
- Gives a constant, low iron content, and as a consequence, low hard zinc formation.
- Few moving parts, simple maintenance, resistant to corrosion
- Cost effective, automatic process
- Scientific and profitable environmental technology



Surface without the RECYCLEAN system



Surface with the RECYCLEAN system

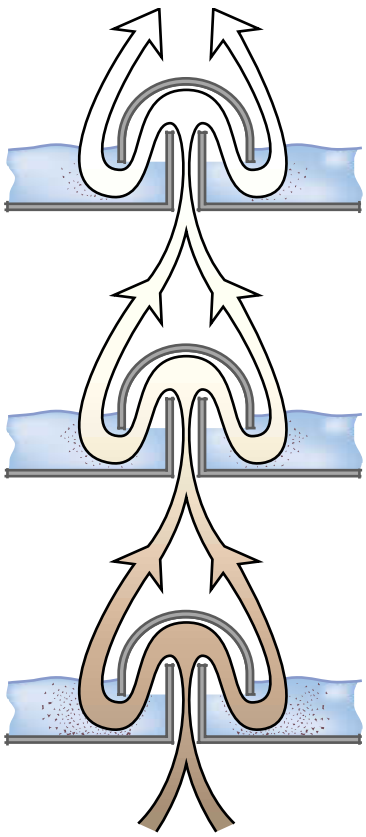
The iron level in the flux bath is guaranteed to stay below 1 g/l, on condition that the process has a closed rinse stage, in accordance with the Recyclean principle (light pickling).

GPS Air cleaning

When using hot-dip galvanizing, large amounts of gasses, steam and particles are discharged into the air, from degreasing, flux and pickling baths, and galvanizing. This has always been a serious environmental problem for the staff who have to work in an unhealthy, and in many cases dangerous, working environment. Even from a general environmental perspective, hot-dip galvanizing often causes problems of smells, which affect the surrounding area and sometimes cause difficulties in dealings with the municipality's environment department.

The discharge of polluted air also brings large financial disadvantages, as the chemicals that disappear with the air have to be replaced by costly purchasing of new products. Now there is a completely new way to clean the air and make use of the chemicals.

Recyclean GPS (patent applied for) is a separator for cleaning air and flue gases when carrying out hot-dip galvanizing. The polluted air is sucked through a number of levels in a tower, by a powerful fan. The flue gases meet separation liquid, flowing through the tower in the opposite direction. The process is totally unaffected by the moisture content of the intake air. This means that the separator can be used to clean air from the galvanizing chamber at the same time as cleaning the air from the pre-treatment (the pickling plant). GPS is load-controlled and very energy efficient. It works continuously, with almost 100% separation of particles and gases. The air that is discharged to the atmosphere is completely clean and safe, without any unpleasant smells. The GPS method allows hydrochloric acid, flux salts and zinc to be reclaimed from the hot-dip galvanizing process for production, which means that the plant will repay the investment made in it in a very short time.



The principle (patent pending) is ingeniously simple. The fan sucks the air through the cleaning liquid in the different cleaning zones in the tower. Solid particles are separated out, flue gases are cleaned, the chemicals are taken care of and out flows clean air.

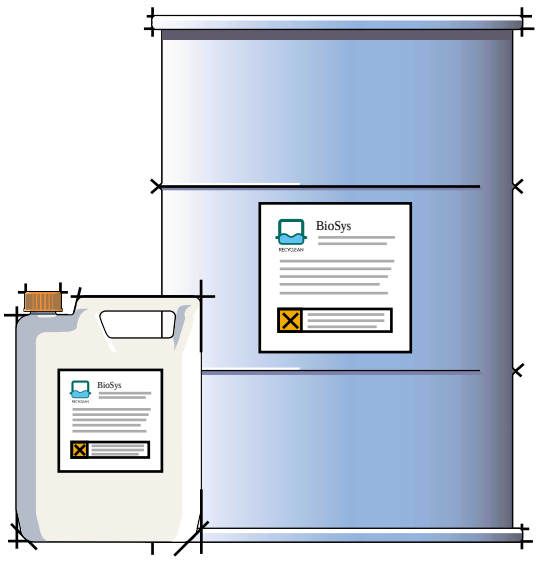
BioSys Power 2550

BioSys Power 2550 is used to degreaseand clean different types of metalsurfaces, for example in connec-tion with hot-dip galvanizing,phosphate pre-treatment, painting or electroplating . BioSys Power 2550Scan also be used for electro-lytic degreasing.

The process is based on solvent-free, water-based degreasing agent for metals, which replaces lye, trichlorethylene, and hydrocarbon-based solvents, and which, in combination with Recyclean's high efficiency rotating lamella separator, provides an environment-friendly degreasing system with constantly high bath quality.

The system works at a temperature of around 30 - 60°C, which makes it very energy-efficient. When BioSys Power 2550 isused as a biological degreaser (Recyclean BDS), RecyBact bacteria are included, which break down theoil. The more oil that is put in, the more active the bacteria become. In this way there can be a large-scale reduction of oil, even if large quantities of grease and oil are added. Oil and grease levels can be brought as low as 100 to 500 mg/l. Transfer of contaminants to subsequent stages in the process is therefore minimal.

- No rinsing after degreasing
- Effective
- Low temperature
- Bath life up to 10 years without changing
- (Applies when using the complete Recyclean BDS system)



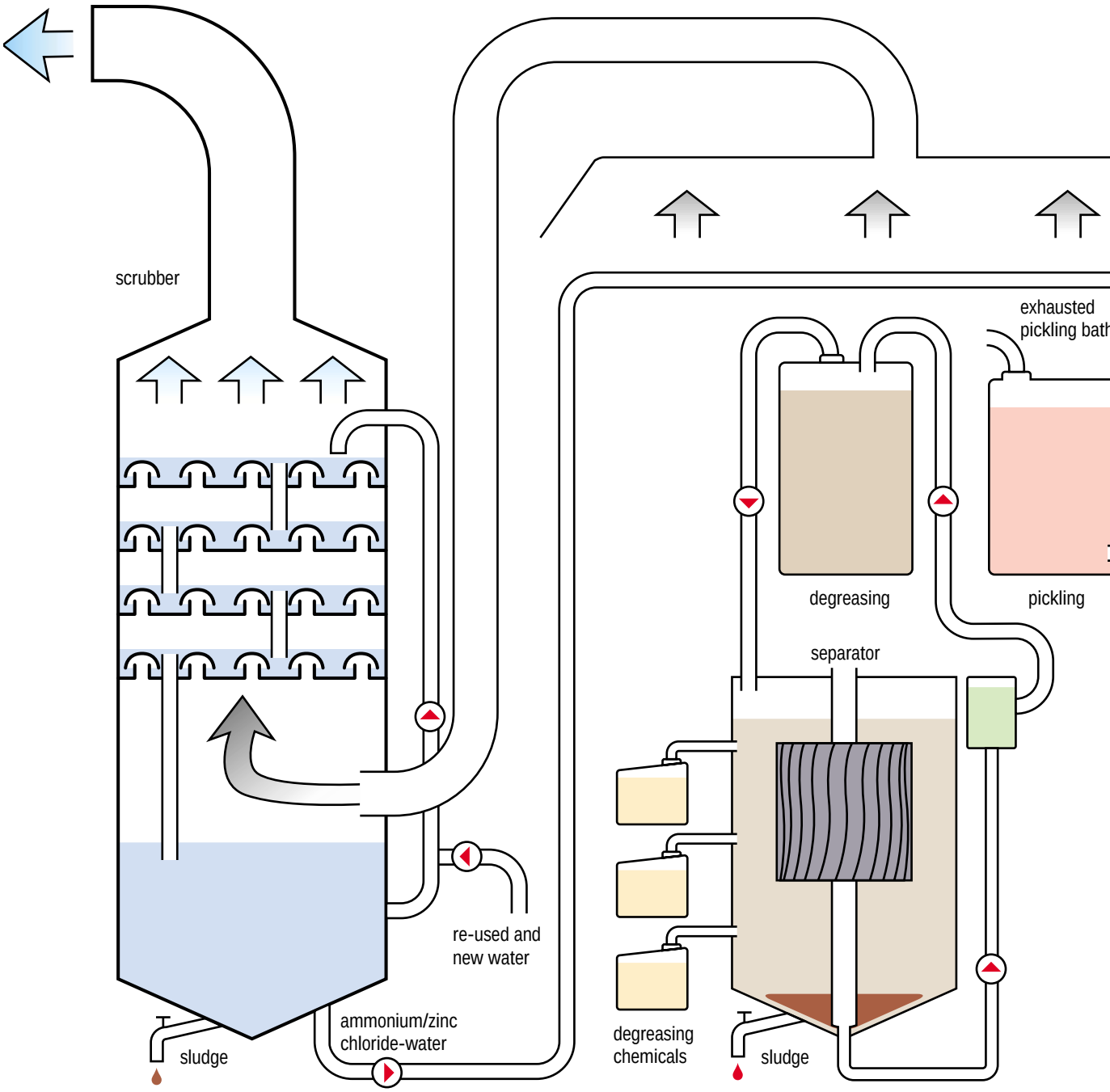
BioSys Power 2550 is supplied in 1000 litre containers, 200 litre barrels or 25 litre plastic cans. The concentrate is mixed with water, at a concentration of 2 – 5% for normally dirty items and5 – 10% for items with heavy dirt.

Hot-dip galvanizing in a closed cycle!

Recyclean's new process means a revolution in surface treatment.

Hot galvanizing of steel has always been a complicated process. The degreasing, which is usually done with lye, acid or hydrocarbon-based solvents, requires high temperatures that uses energy. Oil and grease contaminants are created, which are expensive and difficult to get rid of. The working environment can be unpleasant for the staff, and municipalities aren't keen on the handling the discharges.

But now there is a technology for hot galvanizing in a completely sealed cycle, which gives effectively "zero discharge" to water and air. In this process, the quality of the galvanizing is higher and more even, despite the fact that the method involves considerably lower costs. The process operates at around 38ºC (approximately 80ºC in the old methods), which gives substantial energy savings. You can produce a higher yield in a given time, and chemicals can be re-used in a continuous process, which can of course mean better financial results. The plant pays for itself in a very short time.



Air cleaning

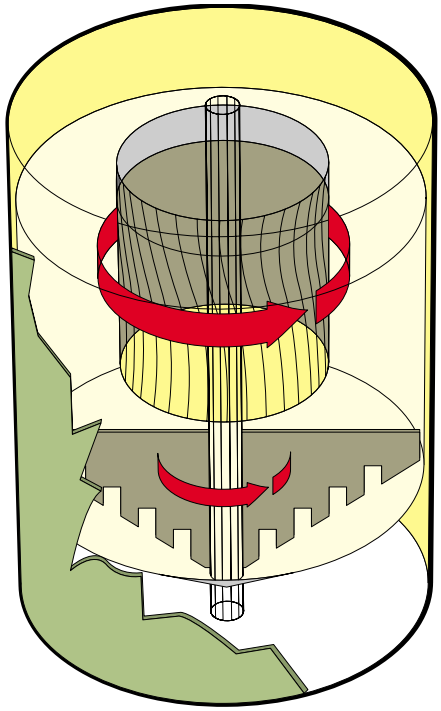
Degreasing/BioSys Power 2550

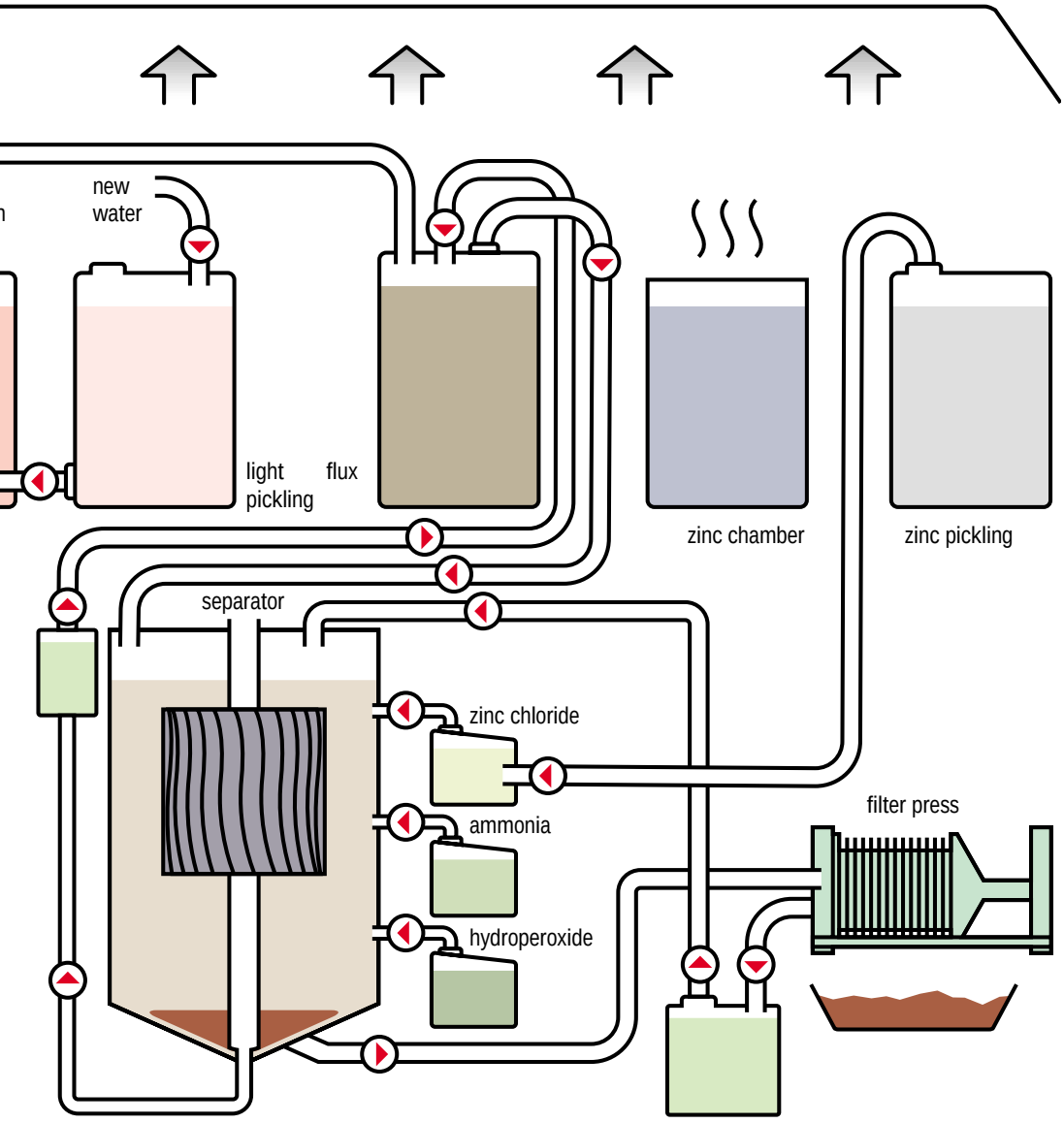
The technology is so revolutionary that many people have trouble believing it's true. But true it is, and as unequivocal proof there are a number of plants in full production in the Scandinavian countries, England, Holland, Israel ,Poland, USA and the Far East. There are 15 plants operating in Sweden alone.

Recyclean manufactures and installs the entire plant, which includes biological degreasing and the hot galvanizing itself, in a process with recycling of production chemicals and cleaning of the discharge air and waste water.

The most important steps in the process are described on the following pages

The flux bath is fed to a separator/reactor, called Recyclean RPS, which separates iron from the flux. Less hard zinc is formed and the consumption of zinc is therefore reduced. The method operates totally automatically, and gives sizeable savings by reducing the amount of raw material purchased.





Flux regeneration

Customer service with analysis at our research laboratory

Recyclean has an ultramodern research laboratory for technology, chemistry and biotechnology, in which new products and new methods in surface treatment are created.

The staff are highly qualified, and leaders in their particular specialities.

Our laboratory is available for our customers, for analyses of everything concerned with hot-dip galvanizing.

The metal content of different baths can be measured and itemised. The effectiveness of the bath can be determined (e.g. bacteria content, degreasing effect, etc.). Degreasing baths, pickling baths and flux baths can be continuously analysed so that customers can see trends, and use this information to have full control over the condition of the baths. The results of the data are printed out and can be transmitted electronically and continuously.

The laboratory can also assist as "on-call support," when a customer needs quick help with analyses to find a problem in a process.

Recyclean's research laboratory is available for our customers for analysis, solving problems both on a continuous and occasional basis.

Typical savings

Assumptions: The following estimated savings are based on a galvanizing installation that has been converted from conventional production technology to Recyclean technology.

Before: Hot-dip galvanizing output 10,000 tonnes/year, with degreasing in caustic soda, pickling in hydrochloric acid, no flux regeneration, air treatment using textile barrier filter.

After: Installation converted to biological degreasing, pickling in iron chloride, flux regeneration and air treatment in RECYCLEAN scrubber.

		Annual saving
Energy saving during degreasing	50%	SEK120,000
Reduced consumption: hydrochloric acid	70%	SEK105,000
Reduced consumption: ammonium chloride	85%	SEK48,000
Reduced consumption: zinc chloride	90%	SEK176,000
Reduced consumption: zinc	6%	SEK470,000
Shut-down of water treatment plant		
including treatment chemicals	100%	SEK950,000
Sludge disposal costs	80%	SEK530,000
Water saving	50%	SEK50,000
Maintenance costs for textile filters	70%	SEK210,000

In other words a total saving of over SEK 2.6 million each year!

Which in turn means that the installation pays for itself in around one year!

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