FILTRATION news

2

VII. 97

Introduction

The protection of the environment is an important aspect that industrial companies have to take into account while making their investments.

Nowadays, in all industrialised countries, new legislation and rules are being passed to ensure better and more efficient protection of the environment.

In the metallurgical industry correct filtration, of liquids used in production processes, has a great influence, by reducing the waste generated.

For the reasons stated, and many more, we think it is useful to give technical information about the improvement of the environmental impact accomplished thanks to correct filtration.

NOVOTECNIC, in collaboration with the laboratories of QUAKER, BRUGAROLAS and HOUGHTON, has prepared a study showing the technical and ecological advantages obtained with filtration equipment which uses consumable filter media.

We are convinced that this information will be of interest to you.

Department of Filtration Engineering

Protect the environment

Filter your cutting oils correctly

What happens when an oil is loaded with metallic particles in suspension?

A cutting oil, having anti-wear and lubricity additives, produces an abrasive compound and the particles in suspension become a catalysing agent.
(See chemical reactions Page 2).

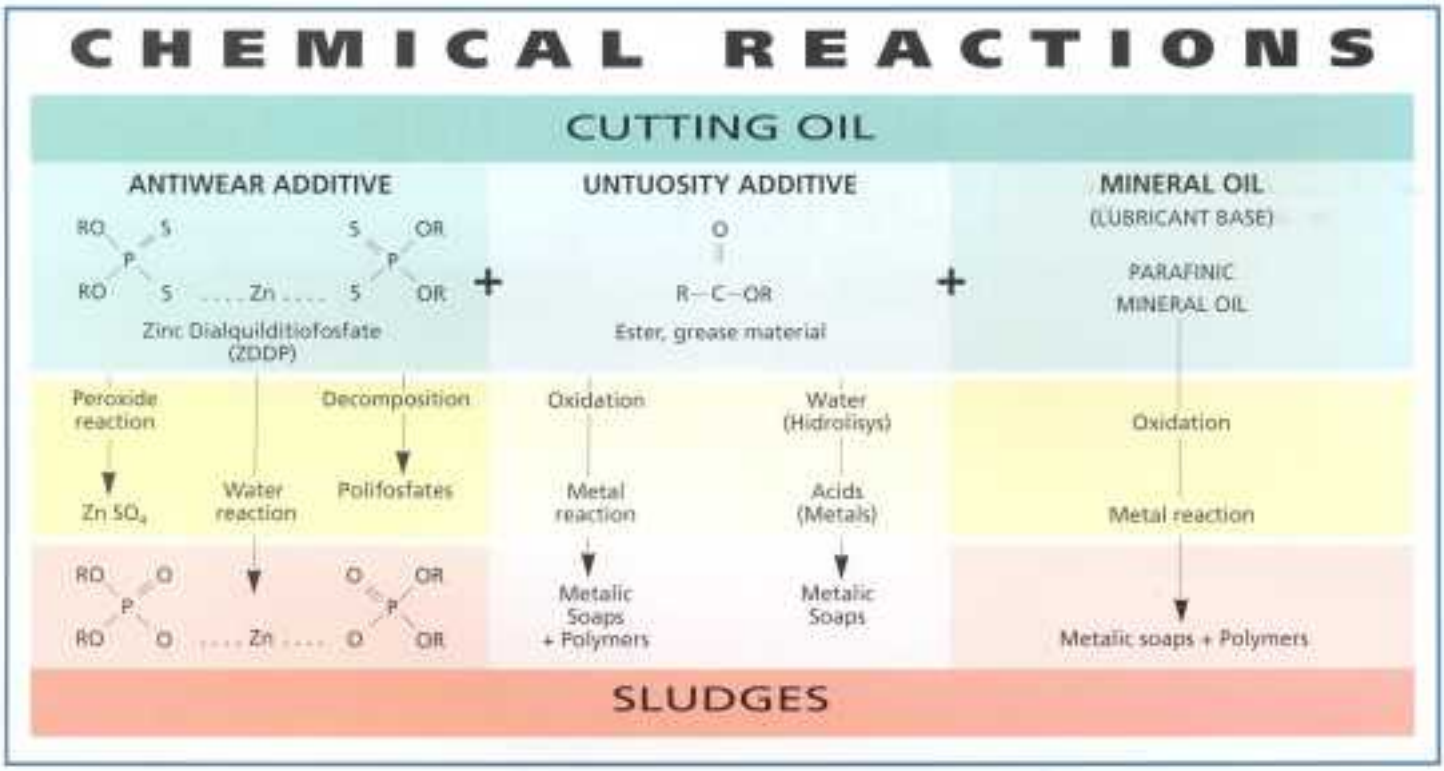


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Main consequences of an oil loaded with metallic particles in suspension



A Sludge production

These chemical reactions produce insoluble components, metallic and polymer soaps, that increase the volume of sludge produced. To the metallic particles we have to add these insoluble chemical composites.

For this reason, a higher volume of sludge is produced which, in the short or long run, necessitates treatment for its neutralization before its disposal.

B Additives loss

The chemical reactions that are produced, consume the additives (antiwear, extreme pressure, anti-rust, etc.) which give the specific characteristics to the cutting oil, which makes it necessary to replenish them periodically, to maintain the required characteristics.

C Acidity

The catalysing effect of the particles in suspension, produces an acceleration of oxidation of the cutting oil, increasing its acidity and making necessary to change the oil periodically. This change has a great impact on the Environment, because it produces the treatment and destruction of large volumes of cutting oil. These processes force the use of complex purifying systems for the residual waste, smoke and ash with the consequent economical and environmental costs.

Companies that are concerned about protection of the environment:

Maintain their oil clean, with minimum particles in suspension. With this the stability of the oil characteristics is maintained, as well as the level of acidity, avoiding the need to replenish additives and to change the oil periodically. **Thus preserving the environment.**

Particle contents level in the cutting oil

OPTIMUM
ISO 4406 CODE 16/13,
(less than 15 mg/L)
(See ISO table on page 8)

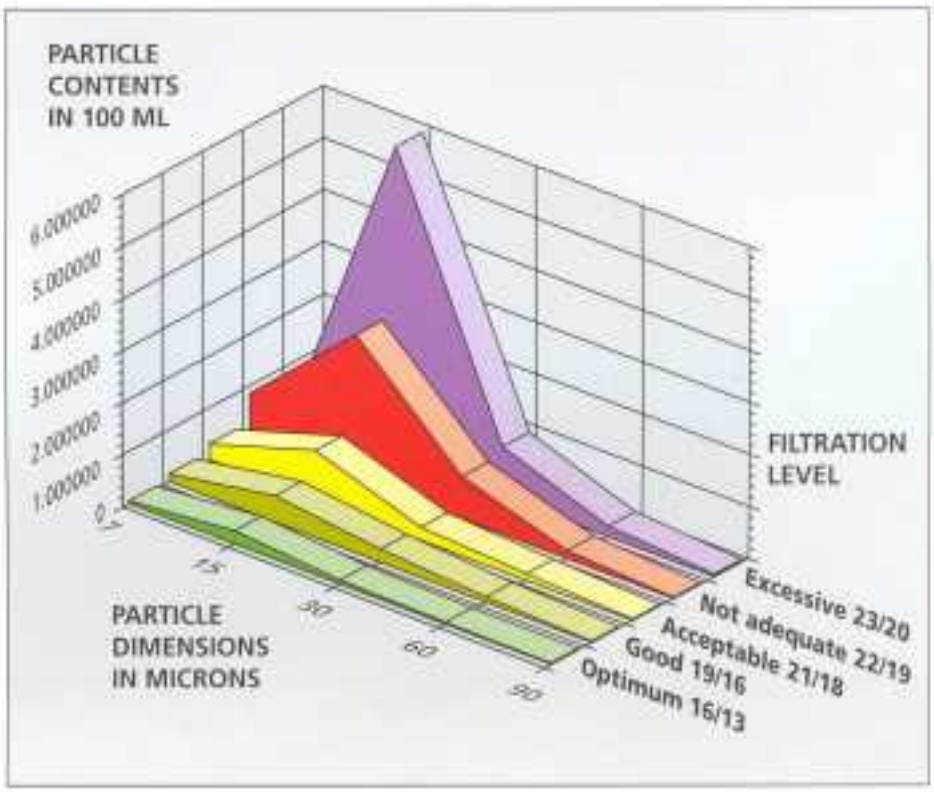
- The cutting oil is maintained with all its characteristics in terms of additives and acidity. The best solution is to maintain particle contents of <15 mg/l, which corresponds to an ISO 4406 Code 16/13 see graph n° 1.
- As an indication, ISO 4406 Code 16/13 is the highest level of particle contents allowed for manufacturers of hydraulic oil.

GOOD
ISO 4406 CODE 19/16,
(between 15 and 50 mg/l.)

- Under the condition that no CBN nor diamond wheels are used, nor surface finisch under Rz 1 is required, levels of particle contents between 15-50 mg/l can be allowed.
- This cutting oil maintains its specific characteristics and the efficiency of the tools and the machine is good.

ACCEPTABLE
ISO 4406 CODE 21/18,
(between 50 and 100 mg/l)

- The chemical reactions shown previously affect the oil substantially, forming sticky sludge (metallic soaps + polymers). For example, on overhead surfaces, joints, tracks, honing heads, protections, tanks, etc.
- The cutting oil starts to lose its specific characteristics and the efficiency of the tools and the machine is decreased.



NOT ADEQUATE
ISO 4406 CODE 22/19,
(between 100 and 200 mg/l)

- Soap formation.
- Particles in suspension behave as abrasive agents and damage the machined pieces as well as the mechanical elements of the machine exposed to the oil.
- If this dirt is mixed with contents of water above 0,1%, the hydrolysis reactions and polymerisation's are produced, causing an increase in acidity and viscosity of the oil.
- The oil degrades and produces the chemical and physical phenomena, indicated in fig. 1 on page 2, which makes it advisable to change the cutting oil.

EXCESSIVE
>ISO 4406 CODE 23/20,
(more than 200 mg/l)

- Production decrease due to an increase of defective pieces.
- Fast cutting oil degradation due to the loss of its additives and acidity increase.
- Increase in tool and wheel consumption; a level of solids of this magnitude affects directly their efficiency.
- Sticky layers are formed, with the corresponding increase of maintenance costs for cleaning the machines.
- Maintenance costs increase, due to greater wear of the machine elements that are in contact with the cutting oil full of particles.
- Excessive oil consumption.
- Appearance of bacteria which causes different skin problems.

Main advantages of a correct filtration

- More production
- Better geometry
- Better surface finish
- Healthier workplace
- Environment protection
- Less production costs
- Less maintenance costs
- Less tool consumption
- Less wheel consumption
- Less coolant liquid consumption

How to filter cutting oils?

Cutting oils, when possible, should be filtered with **precoat filters,** in order to achieve an **optimum** filtration level easily, profitably and efficiently.



Some advantages of precoat filtration systems

1 Unlimited life of cutting oils

As a result of the fine filtration quality, the cutting oil remains in **optimum** condition. For this reason it is not necessary to change the oil from filtration central systems.

The companies that use **NOVOTECNIC** precoat filtration systems, have never needed to replace the cutting oil, in many cases for more than 20 years.

2 Wheel efficiency increase

In a factory with 50 grinding machines for drills and taps, after installing the **NOVOTECNIC** central systems, to replace the existing filtration equipment, the consumption of wheels decreased by 30%.

3 Lower volume of sludge to evacuate

With the **NOVOTECNIC** automatic sludge drying device by compressed air, the sludge discharged contains only 10 to 15% of oil (see photograph n° 2).

4 Ecological filter media

Where possible, **NOVOTECNIC** precoat filtration systems use cellulose, which comes from the core of maize, which is an annually renewable resource.



5 Reduction in the use of washing detergents

When cutting oil is used, filtered to an **optimum** level, as it is by using **NOVOTECNIC** filtration equipment, the cooling oil cleans the piece that is being machined, resulting in simpler washing processes and washing baths last longer. This further protects the environment by lowering considerably the volume of the washing fluids that have to be disposed of.

6 Ease of incineration

Using cellulose as a filter media and drying the sludge with the automatic drying device from **NOVOTECNIC**, makes its disposal easier, because of the possibility of incinerating the sludge with some other industrial debris. There are many factories that have incinerators.

Applications using synthetic solutions and emulsions

Central precoat filtration system using synthetic solution for grinding watch components



In October 1994 **NOVOTECNIC** installed in the factory of E.T.A. Greenchen (Switzerland), one precoat filtration central FTD 20 DA 12.

The company E.T.A. is one of the main manufacturers of watch components. From their factory come the mechanisms for the watches globally known as *Swatch, Longines, Omega, Rado, Tissot*, etc.

This filtration system has centralised the synthetic solution used in a high precision DISKUS grinding line and has increased the efficiency and quality of the grinding process for mechanical watch components.

The precoat filtration central FTD 20 DA 12 uses diatomeceous earth as filter aid, and gives a flow of 1200 l/min. with an **optimum** nominal filtration quality (ISO 4406 Code 16/13), that assures and unsurpassable grinding quality.

Pneumatic vacuum filtration central for emulsion used in the machining of aluminium gear boxes

In February 1994 **NOVOTECNIC** installed a pneumatic vacuum central filtration system, type FIDE 4 DA 30, in the factory of COMESA (Barcelona).
COMESA is a company participated by the IVECO and ZF groups, which manufactures drivingshafts and gearboxes for the European market.
The filtration central is provided with a system of velocity channels for collecting the cast iron chips and emulsion. The chips are tranported to a predredge tank that extracts the larger chips, that are then discharged into a container. The emulsion continues to a settling tank with automatic dredge. The emulsion, once settled, is pumped to a pneumatic paper band filter providing a level of **good** filtration (ISO 4406 Code 19/16).

The emulsion is discharged into the clean tank, from where it is pumped to the distribution line for the machines forming the gear box machining line.
The central system also has a fully automatic system or refilling by means of a volumetric dosing-mixer of concentrate and water. A surface dredge system removes the tramp oil and sludge that are floating on the emulsion.
After more than 3 years in service, the emulsion remains totally clean and in perfect working condition.



The next «Filtration News» will be about:

- Contents index of particles in liquids NAS 1638
- Filtration influence on the honing process
- How to select the correct filtration system
- Investigation project of the European Community for the development of high speed grinding machines

Standard ISO 4406

INDEX OF PARTICLE CONTENTS

	* CODE	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
PARTICLE QUANTITY	more than	8 M	4 M	2 M	1 M	500 k	250 k	130 k	64 k	32 k	16 k	8 k	4 k	2 k	1 k	500
	less than	16 M	8 M	4 M	2 M	1 M	500 k	250 k	130 k	64 k	32 k	16 k	8 k	4 k	2 k	1 k

M = millions; k = thousands

* ISO 4406 Codes are formed by two numbers:
  - the first indicates the number of particles larger than 5 µm, in 100 ml.
  - the second indicates the number of particles larger than 15 µm, in 100 ml.

EXAMPLES

Filtration degree achieved by using NOVOTECNIC filtration equipment:

ISO 4406 Code 16/13

- between 32k and 64k particles larger than 5 µm, in 100 ml.
- between 4k and 8k particles larger than 15 µm, in 100 ml.

Average filtration degree allowed to a lubricating oil at refinery:

ISO 4406 Code 19/16

- between 250k and 500k particles larger than 5 µm, in 100 ml.
- between 32k and 64k particles larger than 15 µm, in 100 ml.

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BELGIUM	Fax. 32-3-4577951	INDIA	Fax. 91-212-676006	SLOVAKIA	Fax. 42-02-7822214
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