

ALCASPEC

AN EFFICIENT, GREEN AND SUSTAINABLE
DEGREASER FOR THE HDG PROCESS

WHY A NEW DEGREASER?

The industrial diffusion of the high efficient TURBOTANK pickling system gave us the opportunity to understand better the degreasing influence on the pickling quality. Even with the best pickling process the degreasing step remains a key factor for a high quality HDG process.

10 Turbotank installed – 17 pickling positions

A NEW DEMANDING SCENARIO

Energy costs,
Environmental issues,
Low quality steels,
New zinc alloys,
New range of metalworking fluids, cutting oils and welding
sprays

“A good start is half the battle”

DEGREASING METHODS: STATE-OF-THE-ART

A good steel pre-treatment is a prerequisite for a good galvanizing process. We do not want here to make an exhaustive survey of all the current degreasing methods available on the market but we want to focus on the two main product groups:

Acidic and High-Temperature Alkaline degreasers.

DEGREASING METHODS: STATE OF THE ART

Although an acid degreaser is known to simplify the handling of the degreasing bath, on the other hand the acid degreasing performance cannot compare to that of a high temperature alkaline degreaser.

Nevertheless, traditional alkaline degreasers have many drawbacks in terms of energy costs, the need for at least one rinsing bath, high risks of oil separation and short life.

TABLE 1: PROS AND CONS OF THE TRADITIONAL DEGREASING PROCESSES

	ACIDIC DEGREASER	High-Temperature ALKALINE DEGREASER
<u>Global performance</u>	<u>POOR</u>	<u>GOOD</u>
Oil Emulsifying ability	Good	Poor
Rinsing step	Not required	1 or 2 rinsing steps
Operation temperature	20-35°C	>50°C
Vapour emissions	No	Problems with gas and vapour emissions
Bath stability	Sludge problems	Oil problems
Heating costs	Low	Very high
Maintenance	low	Very high

TARGETS OF ALCASPEC

Our expertise in surface chemistry, our close partnerships with major surfactant manufacturers and an open minded co-operation with some galvanizers triggered the development of a problem-free alkaline degreaser.

TARGETS OF ALCASPEC

Our project aimed to assure at least the good performance provided by a traditional alkaline degreaser and at the same time overcome all the drawbacks of an alkaline bath. The ideal properties of a new degreaser must guarantee the following:

TARGETS OF ALCASPEC

<u>Properties</u>	<u>Advantages</u>
Low operation temperature (20-35°C)	Low energy costs for heating the bath, no fumes
No rinse step required	No rinsing water to dispose and 1 or 2 free tanks
Excellent degreasing performance	At least equal to the best alkaline systems
No oil separation	Strong emulsifying effect
Long lasting	No disposal required
Compatibility with pickling	No problems arising in pickling baths
Very low sludge production	No sludge generated by the degreaser
Easy bath handling	Only monthly checks required

GREEN PROFILE

A sustainable profile is an important target for all the new products and technologies.

- Phosphate free
- Fully biodegradable
- More than 80% of components from renewable and vegetable raw materials
- 90% energy reduction for bath heating compared to traditional alkaline degreasers
- No energy cost for cleaning the rinsing bath

LAB TESTS: INTRODUCTION

In order to measure the performance of our ALCASPEC we selected several degreasers from the market and compared them in the laboratory, trying to accurately simulate the daily operating conditions of HDG plants.

Steel pre-treatment has become more and more demanding owing to the evolution of lubricants, metalworking fluids, new welding and heat treatment processes.

LAB TESTS: EXPERIMENTAL CONDITIONS

A. Type of oils used for testing

- Cutting oil from the market
- Exhausted diesel engine oil
- Specsoil, based on vegetable, mineral and waxy matrix

LAB TESTS: EXPERIMENTAL CONDITIONS

B. Test Temperatures

We followed the indications of the chemical suppliers.

- Traditional alkaline degreasers: 55-70°C
- Traditional acid degreasers: 20-35°C
- ALCASPEC degreaser: 20-35°C

C. Dipping time

- The degreasing time was 20 minutes

LAB TESTS: EXPERIMENTAL CONDITIONS

D. Degreasing tests

- The heavy duty test conditions helped us to rank the performance of the diverse degreasers. We tested 10 degreasers:
 - 4 Acid Degreasers
 - 5 Alkaline Degreaser
 - 1 ALCASPEC

LAB TESTS: EXPERIMENTAL CONDITIONS

D. Degreasing tests

- These tests showed the degreasing behaviour of the traditional acid, traditional alkaline and ALCASPECs. We are enclosing the best results achieved by the 3 different types of degreasers

TEST 1: STANDARD PLATES SOILED WITH THREE DIVERSE TYPES OF SOIL.

Figure 1

Standard plates soiled with three diverse types of soil.

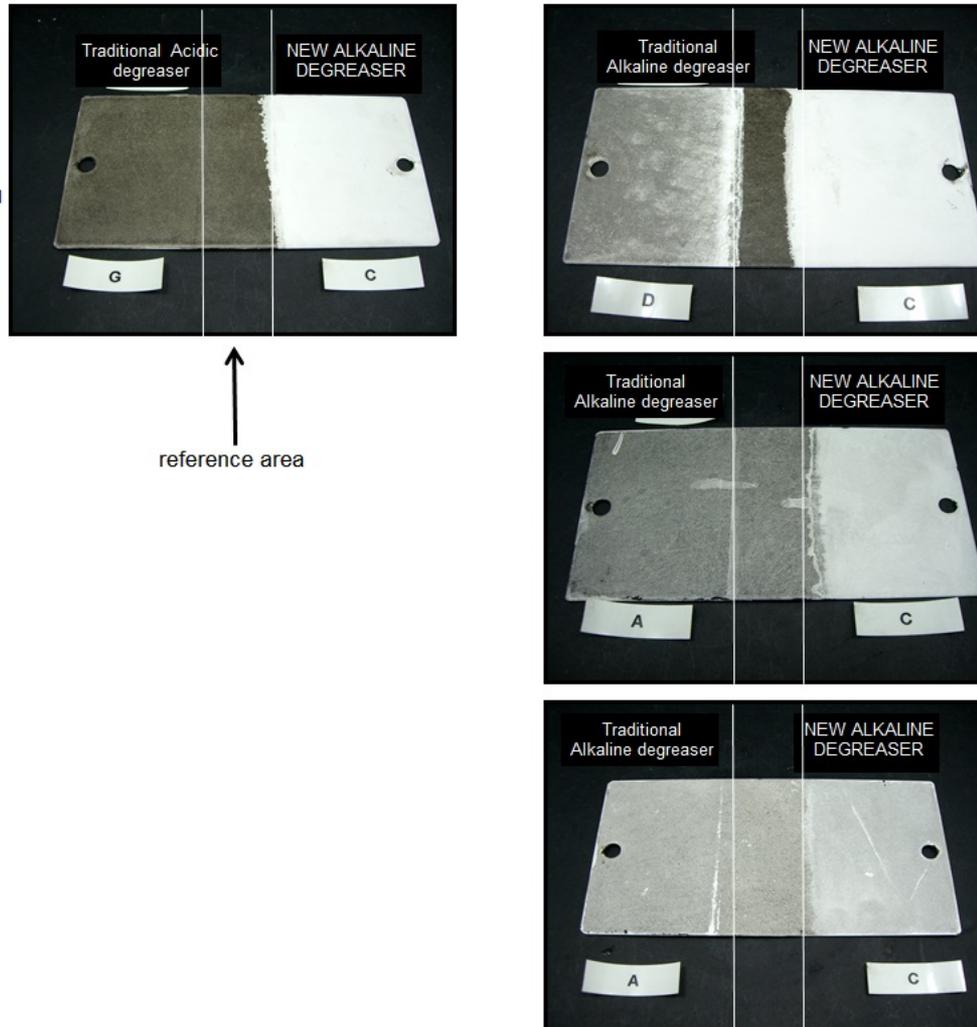


Figure 1 shows the average results of soil removal from the reference plates treated with the 3 different types of soil. This test revealed acidic degreasers to be completely ineffective.

TEST 2: COLD ROLLED TUBES SOILED WITH CUTTING OIL

Figure 2 Cold rolled tubes soiled with cutting oil

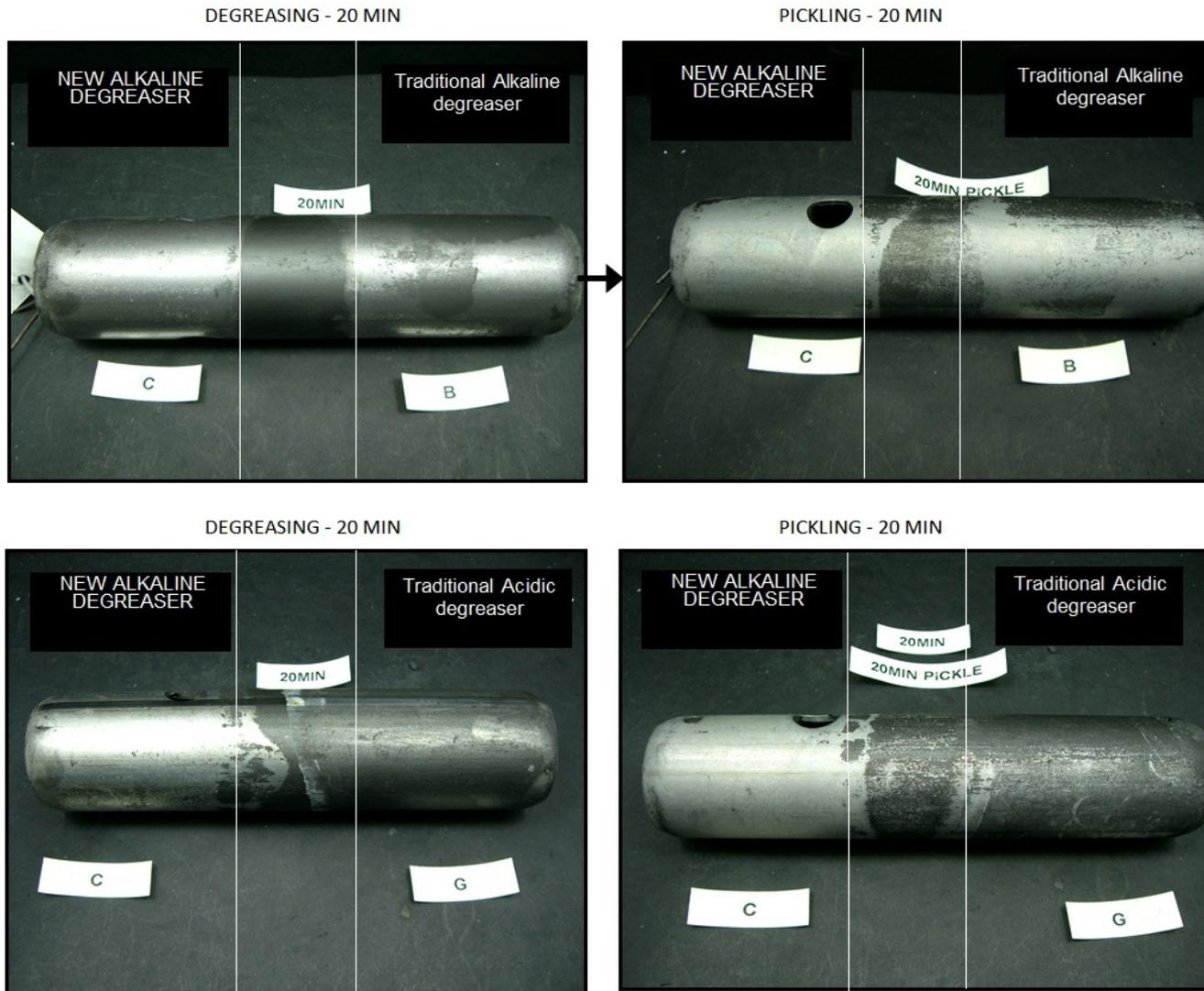


Figure 2 shows once again that acidic degreasers performed far worse than the ALCASPEC and Traditional degreasers

TEST 3: COLD ROLLED TUBES FROM THE SHOP

Figure 3

Cold rolled tubes from the shop without extra soiling

DEGREASING - 20 MIN



PICKLING - 20 MIN



DEGREASING - 20 MIN



PICKLING - 20 MIN



Figure 3 shows that also in this test the results achieved by acidic degreaser were not sufficient.

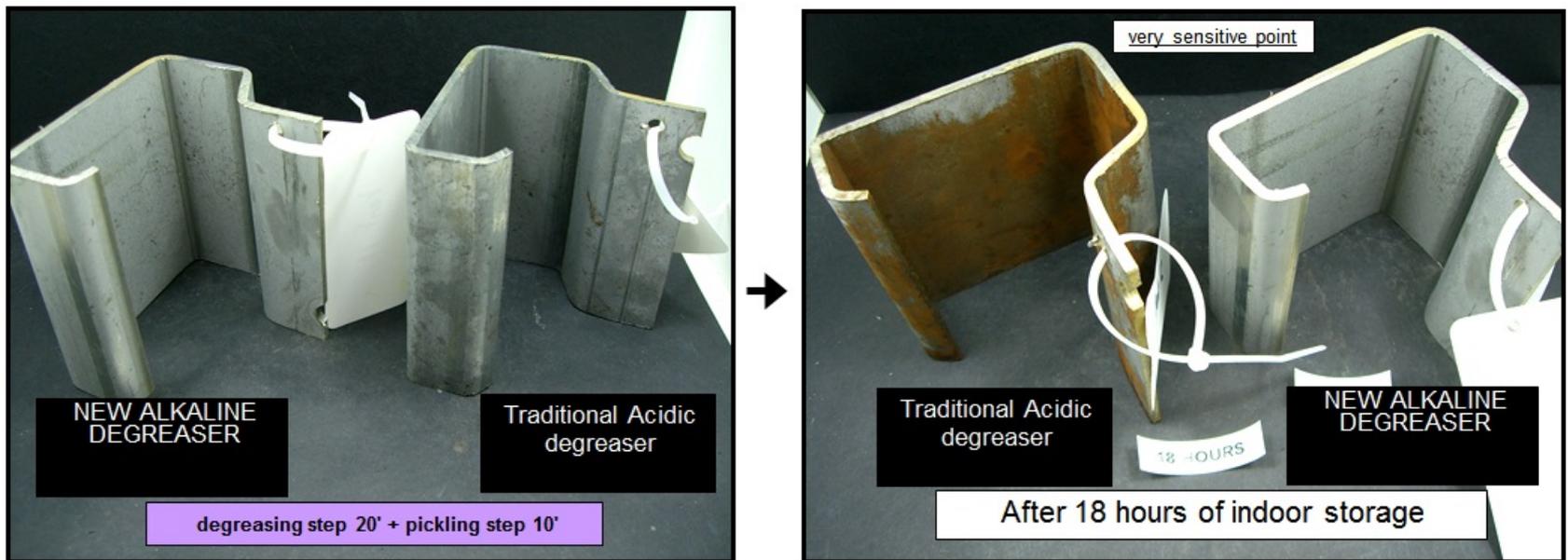
TEST 4: COMPLEX COLD ROLLED PIECES

An important pre-treatment performance indicator is the monitoring of steel oxidation resistance after degreasing and pickling. Figure 4 shows the extent to which the surface of material that has not been properly prepared can turn reactive and generate oxidation after a few hours of exposure to air (lab room).

TEST 4: COMPLEX COLD ROLLED PIECES

Figure 4

Oxydation tendency



TEST 5: EMULSIFYING EFFECT AND BATH STABILITY

A critical issue for degreasing baths is stability over time.

When we say stability we mean:

- Clearness of the bath
- No separation of oil and organics on the bath surface
- No settlement of sludge at the bottom of the bath.

TEST 5: EMULSIFYING EFFECT AND BATH STABILITY

We performed several tests to monitor the stability of several degreasing baths. In order to simulate bath aging, we created a stressing condition by adding an amount of oil equaling 75 kg in a 100 cubic meter-large degreasing tank.

Of course, in these conditions it is impossible to avoid the total separation of oil but we can measure the emulsifying power of the degreaser and its stability tendency over time.

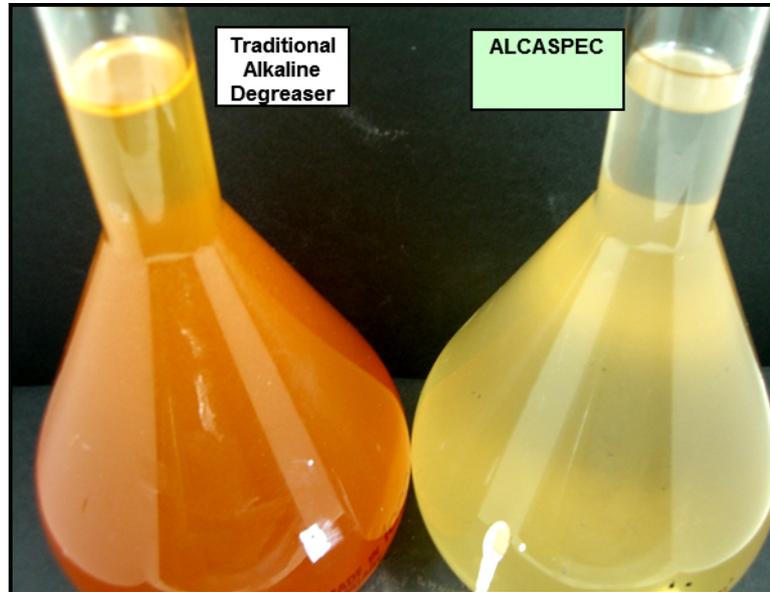
TEST 5: EMULSIFYING EFFECT AND BATH STABILITY

We mixed the oil to the degreasing bath through a vigorous stirring action, then we stopped the mixing and monitored the migration of oil to the flask surface during the following 60 minutes.

Figure 5 shows what the samples looked like at time 0. This test provides a reliable indication of the long-term stability featured by a degreasing bath, this being one of the weakest point of Traditional Alkaline Degreasers.

TEST 5: EMULSIFYING EFFECT AND BATH STABILITY

Figure 5



TEST 5:

Figures 6 and 7, which describe a Traditional Alkaline Degreaser, indicate the amount of oil that migrated toward the surface and thus generated, after 60 minutes, a thick layer of oil on the surface.

Figure 6 Area A - Zoom 200x

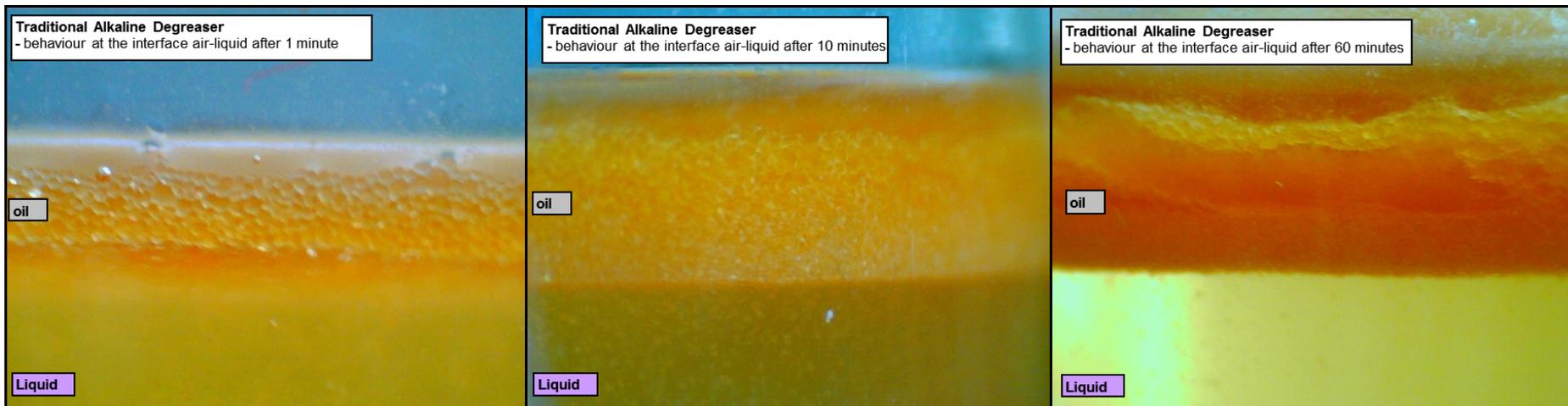
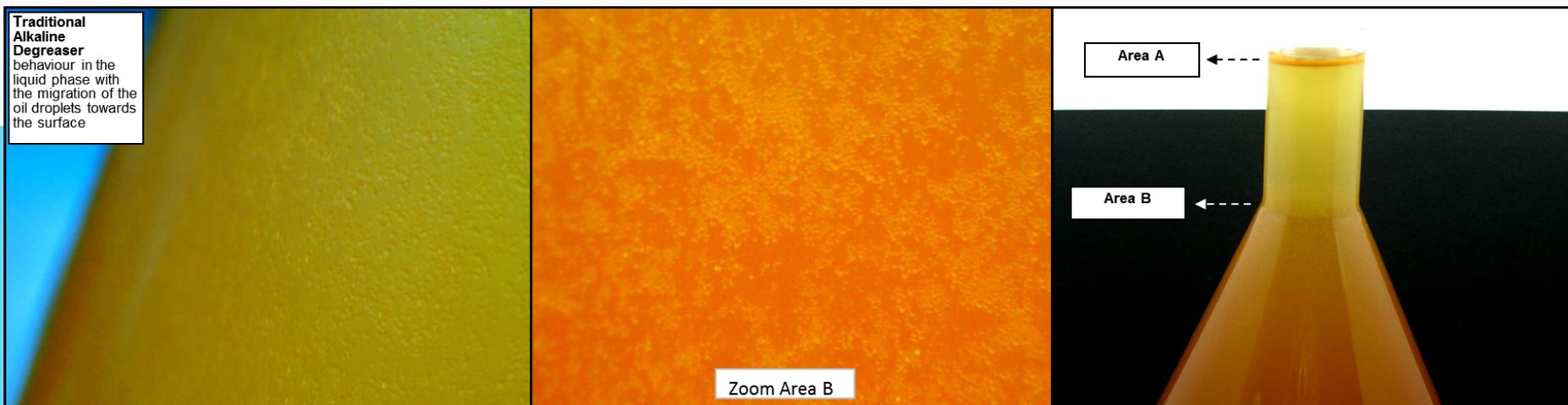


Figure 7 Area B - Zoom 200x

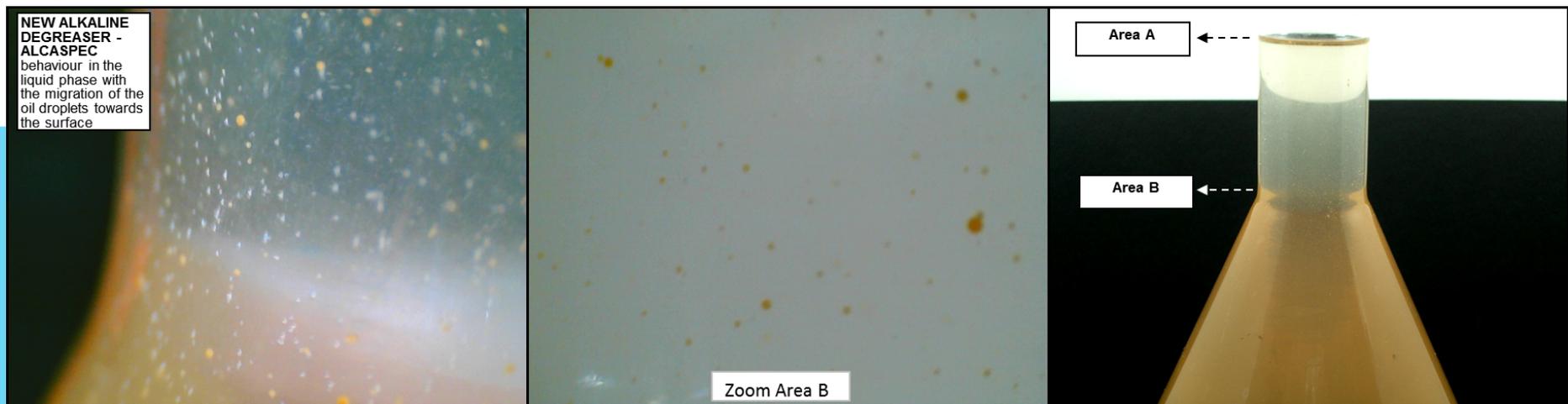


TEST 5: Figures 8 and 9, which refer to ALCASPEC, the amount of oil migrating is far lower compared to the Traditional Alkaline Degreaser.

Figure 8 Area A - Zoom 200x



Figure 9 Area B - Zoom 200x



TEST 6: PERFORMANCE AND AGING OF ALCASPEC

One of the issues posed by our customers was the potential loss of performance over the years.

We compared the performance of two ALCASPEC baths:

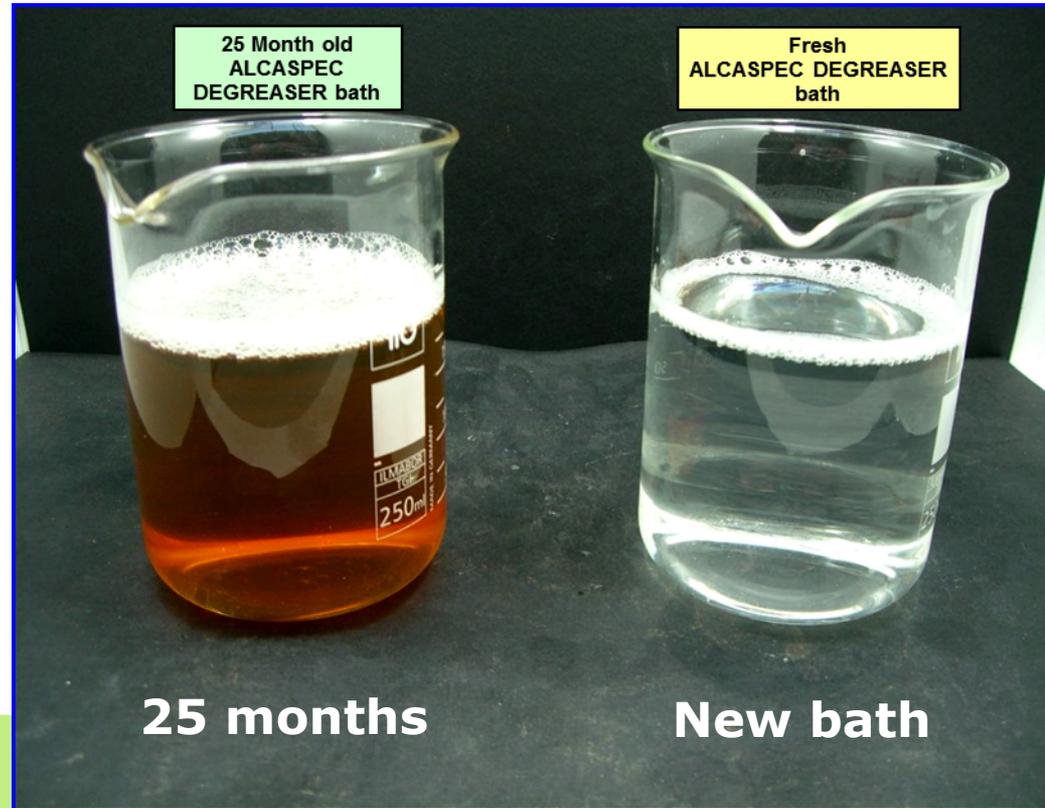
A fresh bath and 25 month-old one

TEST 6

In Figure 10 we compared the aspect of the two ALCASPEC degreaser baths:

The old degreaser bath is still clear, transparent and without separations.

Figure 10



TEST 6

Figure 11

In Figure and 12 we repeated the Tests 1 and 3: the performance of the old degreaser was excellent, with the same performance as a new bath, even after 25 months.

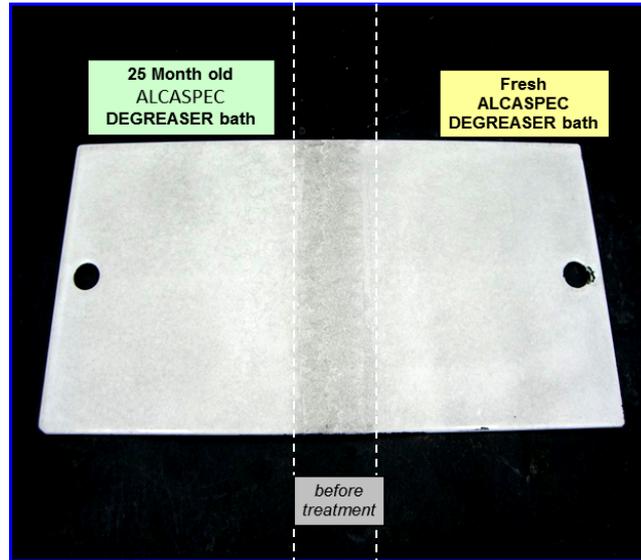
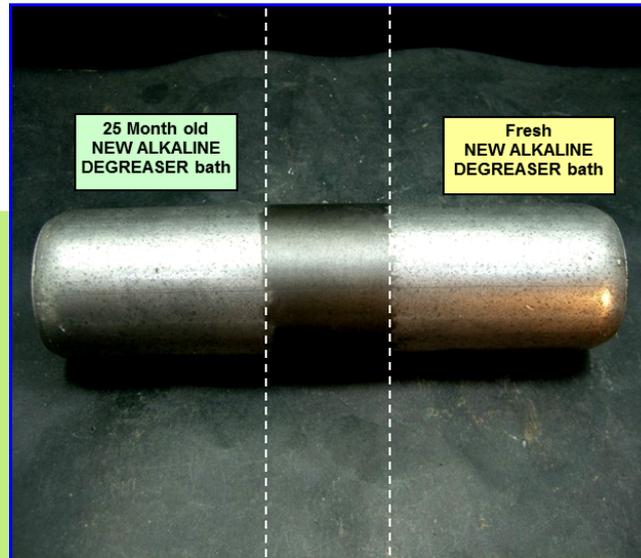


Figure 12



INDUSTRIAL SCALE-UP

The results of the laboratory tests have been confirmed by three years of industrial use.

In addition to performance, other important parameters have been monitored the crucial issues:

INDUSTRIAL SCALE-UP

- No rising step required
- Long-term bath stability, no disposal required
- Oil emulsifying power and no oil separation
- Bath clearness: turbidity is a signal of imminent bath separation
- No sludge production, apart from the oxides and the dust left in the bath
- Negligible acid neutralization (less than one gr/l of acid consumed per year for drag out)
- Very good compatibility with the pickling baths
- No problems with the disposal of exhausted pickling acids

INDUSTRIAL SCALE-UP

To this day, 15 ALCASPEC baths have been installed. Therefore we can confirm that the DEGREASER BATH will never need to undergo disposal.

CONSUMPTION AND BATH MAINTENANCE

BATH CONDITIONS	
ALCASPEC bath concentration	12% w/w
Alcaspec Consumption	0.3-0.4 kg/ton of steel
Bath Maintenance	pH must be maintained between 11 and 12 through addition of NaOH

COST AND DIRECT SAVINGS

Table 2 provides the savings recorded in our three-year experience:

Bath: 60000 lt Production: 25000 tons/y		TRADITIONAL High-Temperature DEGREASER	TRADITIONAL ACID DEGREASER	ALCASPEC
Chemical Costs	€/year	20.000	20.000	20.000
Energy Costs 55°C – Alkaline 35°C – Acid	€/year	18.200	2.800	2.800
Cleaning Costs (oil removal, cleaning rinsing water, filtration)	€/year	12.000	3.000	1.000
Disposal Costs	€/year	13.000	-	-
Total costs	€/year	63.200	25.800	23.800
Reduction	%	59%	59%	62%

BENEFITS & DRAWBACKS

Table 3 displays how ALCASPEC stands out in terms of benefits from the other degreasers. These benefits can bring even more savings than the already consistent direct savings considered above.

Re-worked material, mainly as regards cold-rolled steel, can be completely eliminated

BENEFITS & DRAWBACKS

Table 3		TRADITIONAL ALKALINE DEGREASER	TRADITIONAL ACID DEGREASER	ALCASPEC DEGREASER
Re-worked material		low	high	very low
Maintenance in general		high	low	low
Vapor scrubbers		high	low	low
Quality in galvanizing		high	good/poor	very high
Rinsing baths	Nr	1-2	0	0
CO2 reduction	Ton/y	0 t/y	>200 t/y	>200t/y

BENEFITS & DRAWBACKS

As regards the drawbacks, with ALCASPEC, simply take care to avoid all contamination between the bath and pickling acids, stripping, flux solutions and acid rinse water.

ALCASPEC does not love acidic solutions

ALCASPEC + TURBOTANK

ALCASPEC is the first step to reach a high quality steel pre-treatment.

The combination of the high performance ALCASPEC degreaser with the TURBOTANK process ensures a perfect and smooth pre-treatment process.

Willing to meet you at your plant, we also wish to invite you to visit our company and some of our installations.

Thanks and see you soon



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