(54) Abstract Title: Paint stripping method using used brake fluid and alkali hydroxide

(57) A composition and method for stripping and cleaning organic coatings from substrates, comprising a solution of used brake fluid, an alkali metal hydroxide, and optionally water and/or surfactant. The composition is very cheap to produce in large quantities, allowing uniform dipping and spraying, making highly cost-effective the stripping of paint from parts and components that would otherwise be disposed of. Moreover, the recycling of both used brake fluid and defective industrial parts and components is environmentally beneficial over present practices where both are largely disposed of. The invention comprises from 30% to 99% by volume of used brake fluid; from 1% to 20% by volume of an alkali hydroxide or mixture of alkali hydroxides; and optionally from 1% to 25% by volume of a surfactant and/or optionally from 1% to 60% by volume of water.
PAINT STRIPPING

Throughout all areas of manufacturing components are coated for both cosmetic and protective purposes. These components are generally manufactured from ferrous and non-ferrous metals and plastics, and are coated with a wide variety of materials with a similarly wide variety of application methods. Many of these methods employ tooling, jigs, floor grids and containers which also become contaminated with these coatings. All may at some point require the removal of the contaminant coating.

With recent increases in environmental and health and safety awareness there has been a positive drive toward the development of alternative methods for the removal of paint and other contaminant coatings from their substrates for the purposes of recycling, reworking or maintenance. Many items particularly those coated for cosmetic purposes undergo stringent visible inspection and are frequently rejected for paint problems.

Currently these coatings are removed utilising hazardous solvents which were historically relatively low cost, such as methylene chloride (dichloromethane). Their low cost has meant a slower transition from these products to more friendly, more expensive alternatives. These alternatives include aromatics such as N-methyl-2-pyrrolidone (currently under scrutiny as a potential mutagen) and benzyl alcohol, classified as harmful. Although such products are effective they are relatively high in cost as raw materials and are limited in their scope of usage. While they are effective for the removal of polyester and epoxy powder coatings from ferrous and non-ferrous substrates, they are less effective on acrylic coatings and water based primers.

None of these products can be used on plastic substrates such as ABS (acrylonitrile butadiene styrene, a two phase polymer blend made by
polymerizing styrene and acrylonitrile) without causing a severe effect on their structure. Many light, rigid but tough molded products are made of ABS. ABS is an ideal material wherever superlative surface quality, colourfastness and luster are required, and is used widely on an industrial scale, most notably for automotive body parts, wheel covers, enclosures, protective head gear, reusable paintballs, children’s toys including LEGO™ bricks, recorders, plastic clarinets and golf club heads. Many other plastic components are made from polypropylene, nylon, and PAB, (a rigid polyamide dispersion poly-p-aminobenzoic acid in Nylon 6(3)T).

In addition to N-methyl-2-pyrolidone and benzyl alcohol, polyglycols have been successfully used for the removal of a wide range of coatings when used in conjunction with a surface active ingredient, amine accelerators, and an activator comprising a metal hydroxide of either sodium or potassium. Frequently, corrosion inhibitors such as gelating agents or sequestering agents, and builders such as a carbonate to remove excess water are included in such compositions. Pilznienski et al., U. S. Patent Application No. 20030144164, and Miles, U.S. Patent No. 5,894,854, disclose non-ferrous stripping compositions comprising amines and a surfactant, and Belcak et al., U.S. Patent No. 3,954,648, teaches the use of alkali hydroxide.

Dostie et al., U.S. Patent No. 6,855,210, discloses a paint stripper composition for plastic substrates, comprising a polyglycol, alkali hydroxide and a surfactant, but also discloses that the composition requires stripping temperatures of 300°F (148°C) to strip the paint from plastic substrates, and requires an hour or more processing time.

Such a glycol process is hardly cost effective for use with relatively inexpensive parts on an industrial scale given the relatively low value of the part or component to be stripped, and since glycols are expensive to
produce, the cost of glycol raw materials. Paint stripping on an industrial scale, ideally using dipping or spraying, requires large quantities of the paint stripping solvent to restore to a uniform result, making reconstituting cheaper parts and components more expensive than the parts themselves. Frequently, cheaper parts and components are rejected because there is no cost effective way of removing the paint, and it is cheaper to simply dispose of the defective parts than to attempt to recycle them.

Given the dramatic rise in the cost of raw materials and the general increase in moulding technology and capability, many plastic parts are now increasingly complex and thus increasingly valuable. Many of these components are now painted to enhance both their cosmetic appearance and performance. In the event of a simple paint fault, components are either granulated and reused as lower grade material or scrapped and simply sent to landfill as waste. This in turn results in additional costs to the producer over and above the manufacturing and raw material cost.

Painted plastic components as with other materials are now subject to increasingly exacting standards and thorough inspection with subsequent rejects many of which are paint faults. In many cases these rejects are regularly between 10% and 15%. Such items could be readily reclaimed in their component form without affecting their required performance properties. They could then be successfully re-coated and thus reclaimed as a good component.

What is needed is a cost effective way of successfully removing paint from a substrate, a way that is cheap enough to produce and use for recycling parts and components that would otherwise be discarded as not worth the cost of reconstituting.
Brake fluid

Propylene glycol are used throughout industry for many applications including as a solvent in printing inks, as a preservative in floral arrangements, and as a stabilizer in hydraulic fluids, and is widely used in brake and clutch fluid for the automotive industry. Industrial Grade Propylene Glycol (PGI) in hydraulic and brake systems provides lubricity and anti-freezing protection, and to help reduce swelling of rubber parts (see http://www.dow.com/propyleneglycol/prod/pgi.htm).

Brake fluid is a low hazard product, mass produced around the world. Brake fluid is essentially a blend of polyglycols, polyalkalenes and their ethyl esters blended to provide good resistance to water absorption with a high boiling point and low evaporation, attributes that happen to be desirable in the engineering of a paint stripping solution. It is manufactured efficiently and at relatively low cost when compared to current paint stripping solvents.

Throughout the world it is common practice to change the brake fluid in a car at periodic intervals in order to ensure that the brake continues to operate efficiently. Thus, large volumes of waste brake fluid are produced. Waste brake fluid cannot be readily reclaimed for re-use. It is difficult and costly to dispose of. With increased attention around the world to safe effective disposal of waste it is now viable to charge for the disposal of a range of garage produced streams. Many companies allocate significant expenditure for the establishing of effective liquid waste collection and disposal services. In some countries it even has to be managed as a hazardous waste. Best practices usually require collection in dedicated drums and in some cases, prior-cleaning. In quantity, such as in the automotive industry, it needs to be disposed of through waste management organizations, and in any event should not be disposed of down any drain or on the ground.
In a first aspect of the invention therefore, an environmentally beneficial industrial scale method is provided for cost effectively stripping paint from a substrate using recycled brake fluid, comprising: obtaining used brake fluid; preparing a mixture of the used brake fluid and alkali hydroxide; and contacting a substrate with the mixture.

The present inventive approach exploits the fact that waste brake fluid can be obtained as a waste stream making it an extremely cost effective raw material. The waste brake fluid can be cleaned up to provide an excellent and low cost source of polyglycols for paint stripping, comparing highly favourably from a cost point of view with current paint stripping solvents.

In one embodiment of the invention, the contacting a substrate with the mixture is carried out at a temperature of 150°C.

In another embodiment, the contacting a substrate with the mixture is carried out at a temperature of less than 95°C.

In a further embodiment, the temperature of less than 80°C.

In yet another embodiment, the temperature of less than 50°C.

In one embodiment, the substrate is ferrous, non-ferrous, or plastic.

In another embodiment, the substrate is plastic.

Metals may typically be paint stripped at temperatures of 100°C or more, but according to the present invention plastics and metals are successfully stripped at temperatures of lower than 95°C and down as far as 45°C.
For example, the present invention paint can be stripped from a PAB plastic in less than two minutes at a working temperature of 45°C.

In one embodiment, the method is carried out on an industrial scale.

In another embodiment, the contacting of the substrate is carried out on an industrial scale.

In a further embodiment, the contacting of the substrate is by spraying or dipping.

Whilst new brake fluid can be purchased at relatively low cost, it is considerably more expensive than waste stream brake fluid. Moreover, the use of new brake fluid, even if it can be justified cost-wise for recovery of parts, does not entail the recycling of waste brake fluid.

It will be evident to those skilled in the art that an industrial scale paint stripping process employing pure commercial glycols would be too expensive to use for the paint stripping of relatively low cost parts, particularly as dipping or spraying would entail using large quantities of the paint stripping mixture and would entail a certain amount of wastage to make the paint stripping process simple yet effective.

In one embodiment, the mixture consists essentially of used brake fluid and an alkali hydroxide.

In a further embodiment, the mixture consists of used brake fluid and an alkali hydroxide.

The inventive approach contemplates a paint stripping mixture comprising solely used brake fluid and hydroxide. The inventive approach also
contemplates other ingredients present in small quantities such as impurities other than those impurities that are expected to be found in used brake fluid.

5 In one embodiment, the used brake fluid is present in the mixture in an amount of from 30% to 99% by volume.

In another embodiment, the used brake fluid is present in an amount of from 80% to 99% by volume.

10 In a further embodiment, the alkali hydroxide is present in the mixture in an amount of from 1% to 20% by volume.

The inventive mixtures can comprise 1%, 3%, 5%, 7%, 9%, 11%, 13%, 15%, 17% or 20% of the alkali hydroxide.

15 In a further embodiment, the alkali hydroxide is potassium hydroxide.

Both potassium hydroxide and sodium hydroxide provide a suitable hydroxide. The alkali may used in solid form as a flake, or may be used in a liquid form. Alternatively, mixtures of alkali hydroxide, such as mixtures of potassium hydroxide and sodium hydroxide, may be used in the used brake fluid mixtures.

20 In a further embodiment, the mixture further comprises, optionally, water and/or a surfactant.

Either or both of water and/or a surfactant added to a mixture of used brake fluid and an alkali hydroxide may provide a beneficial effect.
High amounts of alkali hydroxide may be more easily taken up in the mixture when surfactant is present in the mixture.

In one embodiment, a surfactant is present in the mixture in an amount of from 1% to 25% by volume.

In another embodiment, from 2% to 5% by volume of a surfactant and from 1% to 20% by volume of an alkali hydroxide is present in the mixture.

When the mixture also comprises a surfactant in addition to the used brake fluid and an alkali hydroxide, the surfactant may be present in the mixture in an amount of from 1-25%.

In one embodiment, the surfactant is an alkylphenol, ethylenoxy ethanol, polyalkoxylate or a phosphate ester.

Those skilled in the art will know that many different surfactants may be suited to being added to the mixture of used brake fluid and alkali hydroxide.

In yet another embodiment, water is present in the mixture in an amount of from 1% to 60% by volume.

The mixture may thus comprise used brake fluid, an alkali hydroxide and water. Optionally, water may be also present in the mixture in amounts of from 1-60% by volume both in addition to surfactant and to mixtures without surfactant.

In a further embodiment, the used brake fluid is present in the mixture in an amount of from 30% to 98% by volume, alkali hydroxide is present in
an amount of from 1% to 20% by volume, and water is present in an amount of from 1% to 60% by volume.

Thus, the inventive mixtures can comprise 30%, 40%, 50%, 60%, 70%, 80%, 90% or even 99% of the used brake fluid.

A surfactant may be present in the mixture in amounts of 1%, 3%, 5%, 7%, 9%, 11%, 13%, 15%, 20% or 25% by volume.

Water may be present in the mixture in amounts of 1%, 3%, 5%, 7%, 12%, 15%, 20%, 25%, 30% or up to 60% by volume.

In one embodiment, the used brake fluid is present in the mixture in an amount of from 70% to 98% by volume, alkali hydroxide is present in an amount of from 1% to 20% by volume and a surfactant is present in the mixture in an amount of from 1% to 25% by volume.

In another embodiment, the used brake fluid is present in the mixture in an amount of from 30% to 98%, alkali hydroxide is present in an amount of from 1% to 20%, and water is present in an amount of from 1% to 60%.

In a further embodiment, the used brake fluid is present in the mixture in an amount of from 30% to 98% by volume, alkali hydroxide is present in an amount of from 1% to 20% by volume, a surfactant is present in the mixture in an amount of from 1% to 25% by volume, and water is present in an amount of 1% to 60% by volume.

A mixture of used brake fluid, alkali hydroxide and surfactant may be used for effective paint stripping of a substrate. Equally, a mixture of
used brake fluid, alkali hydroxide and water may be used for effective paint stripping of a substrate.

To a mixture of used brake fluid, alkali hydroxide and surfactant, optionally water may be added in an amount of from 1% to 30% by volume.

Alternatively, to a mixture of used brake fluid, alkali hydroxide and water, optionally, a surfactant may be added in an amount of from 1% to 25% by volume.

The inventive approach thus contemplates a mixture of from 30% to 99% by volume of used brake fluid; from 1% to 20% by volume of an alkali hydroxide or mixture of alkali hydroxides; and optionally, from 1% to 25% by volume of a surfactant and/or, optionally, from 1% to 60% by volume of water.

In a second aspect of the invention, an improved industrial-scale paint stripping composition for use with a substrate is provided comprising used brake fluid and an alkali hydroxide, with optionally, water and/or a surfactant.

The inventive approach provides the plastic component manufacturer for the first time with a cost-effective option to reclaim otherwise rejected painted components, re-coat them and sell them as good product, while also enjoying the following significant advantages: reduced raw material costs; low temperature processing; fast turnaround times; reduced moulding costs; increased moulding capacity; and reduced disposal costs.

Moreover, the benefits to the environment are significant. On a global scale, the use of recycled brake fluid for paint stripping enables a
significant reduction in waste components and used brake fluid. Industry would benefit from a higher yield of manufactured components and concomitant reduced costs.

What is new and unexpected is that the present inventive approach provides a cheap and cost effective way of paint stripping comprising using recycled used brake fluid in an industrial scale paint stripping process for a variety of ferrous, non-ferrous, and plastic or polymer-based substrates at a temperature of below 90°C, and even as low as about 40°C. Thus, on one hand used brake fluid is not wasted or dumped into the environment. On the other hand, because there is no need for the provision of expensive glycol or other paint stripping components, the inventive approach makes it possible to paint strip substrates that were hitherto discarded for being too expensive to try to recover or recycle.

Thus, the present valued use for used brake fluid provides a useful conduit for used brake fluid where a reasonable economic reward attracts preservation of the brake fluid as a commodity rather than dumping or disposal. Its use for another industrial purpose means that overall the amount of glycols used is diminished. While glycols are not toxic in large amounts, reusing them rather than making more arguably reduces the overall quantity of glycols in use.

Brake fluid is discarded when, among other reasons, it has accumulated a certain quantity of water from use in a car’s braking system. Water in the brake fluid does not diminish the usefulness of the used brake fluid, and in fact is advantageous to the inventive approach because a certain amount of water may be required in conjunction with the alkali hydroxide. Thus, water already present in the used brake fluid component makes it possible to use the alkali hydroxide without further mixing with water if desired, lowering the cost of production still further by omitting a process step.
The low cost of the brake fluid component in the inventive mixture makes it possible to dip or spray the parts and components from which the paint is being stripped without nearly so much regard to the cost of the glycol component as is the case in conventional paint stripping glycol mixtures. Thus, the cost effectiveness of using ample quantities of the inventive mixture for dipping or spraying makes it possible to cost effectively recycle considerably more units and also to produce a more uniform result in the recycled units. The low operating temperatures and rapid processing times are also highly beneficial.

Methodology

The waste or used brake fluid of the present inventive approach is, for example, a mixture of DOT 3 and DOT 4. Common brake fluids, suitable for the present inventive approach, are generally designated by their boiling point range by a name such as DOT 3 (see http://www.dow.com/PublishedLiterature/dh_006b/0901b8038006beeb.pdf) or DOT 4 (see http://www.dow.com/PublishedLiterature/dh_0075/0901b8038007598f.pdf). As used brake fluid generally contains some contaminants, the contaminants can optionally be processed to remove them if desired, although this is not necessary for practising the inventive approach. Contaminants are generally limited to those found in or around a garage workshop and are mainly waste engine oil, water, and general solids such as cigarette ends, oil filters, plugs etc. Waste oil can optionally be removed by being floated off through an oil separator tank. Water can optionally be removed, if necessary, through evaporation. General solids can optionally be removed via filtration or settlement.

It will be understood by those skilled in the art that new brake fluid may also be substituted for used brake fluid, although with cost implications
and a loss of the environmental benefits gained by using recycled brake fluid.

Paint stripping is carried out in a bath or tank, or other suitable industrial receptacle. In the quantities shown in the examples below, paint stripping was conducted using a 3000 ml bath, but those skilled in the art will appreciate that the methodology can be easily scaled up to large tank volumes.

The used brake fluid is mixed in appropriate proportions with appropriate proportions of alkali hydroxide. Optionally, the alkali hydroxide is admixed as a solid such as potassium hydroxide flake, or as an alcoholic solution made by dissolving the solid in some brake fluid, and/or a small volume of water. Optionally, a surfactant is added to aid in homogeneity and/or wetting of the solution, particularly for low temperature processing.

**Paint stripping solutions**

The present inventive approach in various embodiments utilises the following components: used brake fluid and alkali hydroxide in an industrial style container or bath. In some cases, agitation may optionally be employed.

Optionally, a surfactant may be added, although inventive solutions will strip paint without a surfactant. A suitable surfactant, however, does allow a homogenous solution to be achieved at low temperatures and reduces the strip times through wetting and improved detergency of the alkali hydroxide, thus reducing alkali hydroxide additions and improving operator safety. Because the solution is homogenous, excessive agitation is not required to maintain a consistent solution thus reducing evaporation losses and energy costs.
Also, optionally, water may be added. The water content in used brake fluid will provide effective processing in its own right. Thus, the waste brake fluid obviates the necessity for adding water, or for providing aqueous forms of alkali hydroxide.

When the substrate is removed from the bath at the conclusion of treatment, a post-treatment, such as a water rinse or water spray, may optionally be performed to remove any vestiges of the coating or residue left. In many cases, however, such post treatment is unnecessary.

It will be evident to those skilled in the art that new brake fluid can be used in the present inventive approach where cost is less critical.

Alkali metal hydroxide

The inventive approach may utilise different alkali metal hydroxides, depending on the particular conditions and needs, including, for example, potassium hydroxide (KOH) or sodium hydroxide (NaOH). It is important for non-ferrous substrates that the stripping solution must also have a water content low enough so the hydroxide is not ionized to an extent that it will attack zinc, aluminium or magnesium substrates.

In the inventive approach, and in one embodiment, potassium hydroxide may be added either in solid form or as glycolic solution of potassium hydroxide or as an aqueous solution. Due to the hygroscopicity of the stripping mixture components including the potassium hydroxide, it has been known with prior art approaches to be necessary to drive off excess water which may become absorbed by the solution during extended times at ambient or low temperatures.
However, in the present inventive approach the possibility of using either a small volume of water or no water at all obviates that problem, as well as providing the possibility of reducing the number of steps in the process.

**Times**

The time that a substrate is required to be contacted by the present used brake fluid composition varies depending upon the particular coating to or residue being treated, the thickness of the coating or residue, and the operating temperature of the composition. Stripping times using the inventive approach may be as little as a minute or two, and frequently, less than two hours. Even on a substrate with a complex multiple paint system which includes a chemical resistant acrylic clearcoat, stripping times are 1 to 2 hours. The inventive approach is particularly efficient for the removal of electrophoretically deposited coatings which can be removed in under 3 minutes.

**Temperature**

The inventive approach uses temperatures of up to 90°C in a bath for excellent stripping results. Temperatures higher than 90°C are not required. Where other methods operate at temperatures of more than 120°C and often above 176°C, the present paint stripping approach is operated at temperatures between 40 and 90°C even for stripping clearcoats and other highly resistant coatings.

**Coatings**

In various embodiments, the present inventive approach strips paint from the following exemplary coatings: powder coatings (acrylics, polyesters, TGIC, epoxies, urethanes, and hybrid formulations); powder monocoats; liquid monocoats; liquid solvent basecoats; liquid one and two component acrylic clearcoats; epoxy-based primers and paints (acrylics, epoxies, and
urethanes); alkyds; acrylics; urethane; oil based primers and paints; cathodic electrocoats (both lead and non-lead types); composite coatings with multiple layers may also be successfully stripped, such as epoxy coating ("Ecoat") with an upper powdercoat; Ecoat, basecoat, clearcoat composite paint (one and two component clearcoat technologies, acrylic and urethane formulas); Ecoat, monocoat composite paint; and Ecoat, primer, basecoat, clearcoat composite paint; electrophoretic primer paints, including: electro-deposition coatings. Water-based organic coatings (primarily acrylics, urethanes and epoxies) can also be stripped with the inventive approach, and certain enamels and lacquer coatings can also be removed.

**Surfactants**

One advantage of the present inventive approach is that the surfactant is not necessary for the inventive approach to perform in a highly successful fashion, as can be seen by the examples below. Prior art stripping solutions encountered foaming issues and related problems, particularly during water rinse processes which must be controlled, for example, by the addition of antifoaming agents to the rinse water.

A variety of surfactants can, however, be optionally used with the present invention, with non-ionic surfactant wetting agents preferred. Suitable surfactants are alkylglucoside based, alkylphenol, ethyleneoxy ethanol, polyalkoxylate or a phosphate ester non-ionic surfactants, e.g. Berol LFG61. Other examples of surfactants can be seen by reference to: [http://www.surfactants.akzonobel.com/bulletins.cfm](http://www.surfactants.akzonobel.com/bulletins.cfm). In various embodiments, surfactants are used in amounts of between 1% and 10% addition to the total bath.

With respect to a suitable though optional surfactant amount in the inventive mixture, various embodiments have between 2% to 5% by
volume.

Substrates
The present inventive approach is suitable for use with plastics, and with
metallics including steel with and without a galvanized zinc layer, roll-
formed steel, zinc die-cast products, aluminium, and aluminium die-cast
products, brass, bronze, copper, titanium, magnesium, plated substrates.
Typical automotive components that are stripped according to the present
inventive approach include for example, exterior sheet metal components,
aluminium wheels and plastic headlight housings, and non-automotive
components such as architectural hardware, lighting components,
plumbing fixtures and electronics housings.

EXAMPLES

Example 1 - used brake fluid, alkali hydroxide (without water)
Bath size 3000 ml
2500ml used brake fluid
125 grams KOH
Temperature 90°C

Results
Sample 1
Automotive Hinge component with electrophoretic coating
Paint swelled in 15 minutes
Completed stripped in 55 minutes

Sample 2
Glass filled nylon 30%
Plastic exterior automotive component with a primer, colour coat and
acrylic top coat
Paint swelled in 75 minutes
Completely stripped after 4 hours

Sample 3
Aluminium die casting – powdercoated

5 Paint runs in 15 minutes
Completely stripped in 45 minutes

Example 2 – used brake fluid, alkali hydroxide and surfactant (without water)

10 Bath size approx 2200 ml – Agitated
2000ml used brake fluid
100 grams KOH
100 ml berol LFG 61
Temperature 70°C

Sample 1
Mild Steel
Automotive component with electrophoretic coating
Paint denatured 10 minutes

20 Completely Stripped in 35 minutes

Sample 2
30 %Glass Filled Nylon
Plastic exterior automotive component with a primer, colour coat and acrylic top coat
Paint denatured 35 minutes
Completely stripped in 2.5 hours

Sample 3

30 Mild Steel
Shelving Bracket with a polyester powder coat
Paint swelled 50 seconds
Completely stripped in 3 minutes 45 minutes

Example 3 - used brake fluid, alkali hydroxide and water (without surfactant)
Bath size (mixture volume) 3000ml
Brake fluid 1000ml
Potassium hydroxide flake 450 grams c. 15% of bath mixture
Water 1550 ml
Heated to 45°C

Results
Sample 1 - ABS plastic (acrylonitrile butadiene styrene)
Washing machine component with a metallic wet paint
Paint swelled in 4 minutes
Completely stripped in 9 minutes

Sample 2 - ABS plastic
Automotive interior trim component with a urethane coating
Paint swelled in 2 minutes
Completely stripped in 7 minutes

Example 4 - used brake fluid, alkali hydroxide and water (without surfactant)
Bath size 3000ml
Brake fluid 1000ml
KOH flake 450 grams
Water 1550 ml
Heated to 75°C

Results
Sample 1 - Glass filled nylon 30%
Plastic exterior automotive component with a primer, colour coat and acrylic top coat
Paint swelled in 1 hour
5 Completely stripped after 3.5 hours

Sample 2 - Mild steel
Automotive hinge component with an electrophoretic coating
Paint swelled in 4 minutes
10 Completely stripped in 8 minutes

Example 5 - used brake fluid, alkali hydroxide, water and surfactant
Bath size 4000 ml
Brake fluid 2600 ml
15 KOH flake 400 grams
Water 800 ml
Berol LFG-61 200ml
Heated to 70°C

Results
Sample 5 - Glass filled nylon 30%
Plastic exterior automotive component with a primer, colour coat and acrylic top coat
Paint swelled in 15 minutes
25 Completely stripped after 65 minutes

Sample 1 - Mild steel
Automotive hinge component with an electrophoretic coating
Paint swelled in 1 minute
30 Completely stripped in 2 minutes 30 seconds
Sample 2 - Aluminium die casting
Lock keep with a polyester powder coating
Paint runs in 3 minutes
Completely stripped in 5 minutes
CLAIMS

1. A method for stripping paint from a substrate using recycled brake fluid, comprising: a) obtaining used brake fluid; b) preparing a mixture comprising the used brake fluid and alkali hydroxide; and c) contacting a substrate with the mixture.

2. The method of claim 1, wherein step c) is carried out at a temperature of 150°C or less.

3. The method of claim 2, wherein the temperature is less than 95°C.

4. The method of claim 3, wherein the temperature is less than 80°C.

5. The method of claim 4, wherein the temperature is less than 50°C.

6. The method of any of the above claims, wherein the method is carried out on an industrial scale.

7. The method of any of the above claims, wherein step c) is carried out on an industrial scale.

8. The method of any of the above claims, wherein the substrate is ferrous, non-ferrous, or plastic.

9. The method of claim 8, wherein the substrate is plastic.

10. The method of any of the above claims, wherein step c) is by spraying or dipping.
11. The method of any of the above claims, wherein the mixture consists essentially of used brake fluid and an alkali hydroxide.

12. The method of any of the above claims, wherein the mixture consists of used brake fluid and an alkali hydroxide.

13. The method of any of the above claims, wherein the used brake fluid is present in the mixture in an amount of from 30% to 99% by volume.

14. The method of claim 13, wherein the used brake fluid is present in an amount of from 80% to 99% by volume.

15. The method of any of the above claims, wherein the alkali hydroxide is present in the mixture in an amount of from 1% to 20% by volume.

16. The method of any of the above claims, wherein the alkali hydroxide is potassium hydroxide.

17. The method of any of the above claims, wherein the mixture further comprises, optionally, water and/or a surfactant.

18. The method of any of the above claims, wherein water is present in the mixture in an amount of from 1% to 60% by volume.

19. The method of any of the above claims, wherein the used brake fluid is present in the mixture in an amount of from 30% to 98% by volume, alkali hydroxide is present in an amount of from 1% to 20% by volume, and water is present in an amount of from 1% to 60% by volume.
20. The method of any of the above claims, wherein from 1% to 25% by volume of a surfactant is present in the mixture.

21. The method of any of the above claims, wherein the surfactant is an alkylphenol, ethyleneoxy ethanol, polyalkoxylate or a phosphate ester.

22. The method of any of the above claims, wherein from 2% to 5% by volume of a surfactant and from 1% to 20% by volume of an alkali hydroxide is present in the mixture.

23. An improved industrial-scale paint stripping composition for use with a substrate, produced by the method of any of the above claims.
**Patents Act 1977: Search Report under Section 17**

Documents considered to be relevant:

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Categories:

- **X** Document indicating lack of novelty or inventive step
- **Y** Document indicating lack of inventive step if combined with one or more other documents of same category.
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- **P** Document published on or after the declared priority date but before the filing date of this invention.
- **E** Patent document published on or after, but with priority date earlier than, the filing date of this application

**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

- Worldwide search of patent documents classified in the following areas of the IPC
- B08B; C09D; C11D; C23G

The following online and other databases have been used in the preparation of this search report

- WPI, EPODOC, TXTE, TXTF, TXTG

**International Classification:**

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