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 Specification No. 106114, Application No. 106114, dated 11th July 1966. Complete Specification left on 8th May 1967. (Application accepted 31st January 1968.)

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PROVISIONAL SPECIFICATION

IMPROVEMENTS IN OR RELATING TO RUST AND SCALE REMOVING JELLY.
 COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJ MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

The following specification describes the nature of this invention,

This is an invention by KUMMATTITHIDAL SANTHANAM RAJAGOPALAN, Scientist and CHAKRAVARTI RAJAGOPAL, Junior Scientific Assistant, both of the Central Electrochemical Research Institute, Karaikudi, India, both Indian citizens.

This invention relates to improvements in or relating to Rust and Scale Removing Jelly.

It is agreed by most corrosion engineers that rust and scale have to be removed before painting if adequate paint life is to be obtained. Millscale is formed as a result of hot rolling and shaping processes carried out at the steel mills. Subsequently, the millscale develops a multitude of cracks which allow water-borne corrosive media direct access to steel. Rusting commences at the exposed portions and the steel surface is soon covered with plenty of rust together with patches of scale which have not been detached as a result of rusting. In order that a protective coating functions effectively, it has been found necessary to remove the scale and rust before applying the coating. Often, the descaling and derusting of steel sheets is not carried out before erection if painting can only be done afterwards. Similarly, in the case of steel structures which have been painted once but have got subsequently rusted, removal of rust before painting is found to be necessary. Removal of rust before repainting is also necessary in the case of rolling stock such as various types of vehicles, railway wagons, coaches etc. In all these cases, the usual methods of descaling such as shot blasting or acid pickling cannot be applied conveniently. A method of derusting and descaling which can be applied to structures *in situ* just before painting is required. It is found to be convenient to use a descaling jelly for the removal of rust and scale in such cases.

The characteristics of a descaling jelly are (1) it does not run off surface on application, (2) the active substance remains in contact with the metal surface for the period required to remove rust and scale, (3) the jelly does not attack the steel while rust and scale are removed, (4) the jelly can be washed off the surface with water before painting. To get the above characteristics, one or more substances which cause derusting and descaling, one or more thickening

agents or carriers which retain the active substance are mixed together with or without a wetting agent. The jelly thus obtained is brushed on the surface of the steel structure, washed off after a sufficiently long period, which varies with the type of descaling jelly employed. References are made to the use of acids such as phosphoric, sulphuric and acetic acids as active substances, oxidising salts such as potassium permanganate as active substances and to the use of bentonite, silica, kieselguhr, talc etc., as the carriers or thickening agents. These are open to the objection that the cost of each one of the ingredients is sufficiently high to make the use of descaling jelly un-economical as compared to chipping and wire brushing in this country. Further, some of the materials mentioned in literature have to be imported. The twin disadvantages of using costly materials and the need to import the ingredients are got over in the present invention.

The object of the present invention is to formulate a descaling and derusting jelly which can be made from indigenously available materials and which are available in plenty.

The jelly developed by us is based on cheaply available materials such as plant carbo hydrates and plant proteins and a cheap mineral acid produced in large quantities in this country together with a very small amount of a commonly used fungicide. This jelly is found to satisfy the following requirements :

- (i) The materials employed are abundantly available in this country.
- (ii) They are of reasonable low cost, and
- (iii) Satisfactory performance as defined under characteristics.

The formulations of descaling jellies prepared by us are illustrated below :

TABLE I

SOME TYPICAL FORMULATIONS OF THE DESCALING JELLY

Type of plant carbohydrate	Quantity of plant carbohydrate and plant protein gms.	Quantity of acid	Quantity of water	Total cost	Area covered
		ccs.	ccs.	Paise	sq. decimetre
(a)	140	100	100	24	50
(b)	130	100	100	23	50
(c)	100	100	100	28	60

The performance of the descaling jellies developed by us is shown below in comparison with a well-known and very effective remover of rust and scale, namely, hydrochloric acid :

TABLE II
 PERFORMANCE OF DESCALING JELLY

Description of test	HCl	Jelly
(a) Removal of rust and scale from uniformly rusted specimens		
Rusted steel brushed and left overnight and cleaned in flowing water with bristle brush	Not removed	Completely removed
(b) Attack on steel		
(i) Polished steel is brushed and left overnight and visual observations are made on surface condition	Completely rusted	Remains bright
(ii) Polished steel suspended in descaling jelly and HCl solution for one hour	Weight loss is 0.9 gms/12.5 sq. cms.	Weight loss is 0.02 gms/12.5 sq. cms.
(c) Presence of rust remover on metal surface		
Rusted steel brushed and left overnight and examined for presence of rust remover	Evaporates	Remains in tact on the surface

Price : TWO RUPEES.

1. The jelly developed by us can be prepared entirely from the indigenously available materials.
2. The materials employed in making the paste are cheaper than those employed for jellies reported in literature.
3. The jelly developed by us can bring about efficient

removal of scale and rust when brushed on moving and stationary steel structures.

R. BHASKAR PAI
Patents Officer,

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH
Dated this 7th day of July 1966.

COMPLETE SPECIFICATION.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, RAJI MARG, NEW DELHI-1, INDIA, AN INDIAN REGISTERED BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (ACT XXI OF 1860).

The following specification particularly describes and ascertains the nature of this invention and the manner in which it is to be performed.

This is an invention by KUMMATTITHIDAL SANTHANAM RAJAGOPALAN, Scientist and CHAKRAVARTI RAJAGOPAL, Junior Scientific Assistant, both of the Central Electrochemical Research Institute, Karaikudi, India, both Indian citizens.

Annovated title of the invention :

This invention relates to improvements in or relating to rust and scale removing jelly for removal of rust and scale from erected steel structures.

Prior Knowledge :

It is agreed by most corrosion engineers that rust and scale have to be removed before painting if adequate paint life is to be obtained. Millscale is formed as a result of hot rolling and shaping processes carried out at the steel mills. Subsequently, the millscale develops a multitude of cracks which allow waterborne corrosive media to have direct access to steel. Rusting commences at the exposed portions and the steel surface is soon covered with plenty of rust together with patches of scale which have not been detached as a result of rusting. In order that a protective coating functions effectively, it has been found necessary to remove the scale and rust before applying the coating. Often, the descaling and derusting of steel sheets is not carried out before erection if painting can only be done afterwards. Similarly, in the case of steel structures which have been painted once but have got subsequently rusted, removal of rust before painting is found to be necessary. Removal of rust before repainting is also necessary in the case of rolling stock such as various types of vehicles, railway wagons, coaches etc. In all these cases, the usual methods of descaling such as sand or shot blasting or acid pickling cannot be applied conveniently.

A method of de-rusting and de-scaling which can be conveniently applied to steel structures after their erection is the use of a descaling jelly. It is reported in literature that acids such as phosphoric acid are used as active substances and materials like butyl cellosolve, bentonite, silica, keselguhr are used as carriers or thickening agents for the formulation of descaling jellies to remove rust and scale from erected steel structures.

Drawbacks connected with hitherto known processes :

The known formulations of descaling jellies suffer from the following drawbacks :

- (1) Several of the ingredients mentioned in any given formulations of e.g., phosphoric acid, butyl cellosolve are costly and
- (2) materials such as butyl cellosolve have to be imported.

Main object of the invention :

The object of the present invention to formulate a descaling and derusting liquid which will be made from plentifully and cheaply available indigenous materials and which is effective in the removal of rust and scale.

Main finding :

It is found that a thick liquid (jelly) formulated using plentifully and cheaply available materials like plant products and cheaply available acids like hydrochloric acid can bring

about efficient removal of rust and scale without attacking the base metal.

New result flowing from the new finding :

The use of descaling jelly for removal of rust and scale from erected steel structure can come into use in this country only if its cost compares favourably with chipping and wire brushing which are commonly employed. The materials used in the known formulations of descaling jellies e.g., phosphoric acid are costly and some of them e.g., butyl cellosolve require to be imported. The formulations given in this specification use only what are plentifully and cheaply available materials, are very efficient in the complete removal of rust and scale unlike chipping and wire brushing and does not attack the base metal thereby avoiding unnecessary metal loss in the process of removal of rust and scale. This means that the new formulations can be used in place of the less efficient method of chipping and wire brushing thereby resulting in better paint life.

Subsidiary Novel Features :

The characteristics required of a descaling jelly are (1) it does not run off the surface on application, (2) the active substance remains in contact with the metal surface for period required to remove rust and scale, (3) the jelly does not attack the steel to any significant extent while rust and scale are removed and (4) the jelly can be washed off the surface with water before painting.

These are fulfilled by the new formulations.

Statement of Invention :

According to the present invention, the rust and scale removing jelly composition comprises (i) a cheaply available plant product such as ground-nut flour, root flour, maize flour, (ii) a cheap mineral acid such as HCl, H₂SO₄, (iii) a fungicide such as naphthols, nitrophenols and (iv) water.

The ingredients are used in the following proportions by weight :

Plant product	30-50%
Mineral acids	30-50%
Fungicide	1-2%

The process consists in mixing the plant product in water, heating to boiling, adding mineral acid and fungicide and mixing well.

A thick jelly like liquid is obtained having sufficient consistency to be brushed with paint brush, which has the valuable property of removing rust and scale from erected steel structures without attacking the base metal.

Examples :

Examples of cheaply available plant products are—
ground-nut flour, root flour, maize flour, preferably flour of the type not required for human consumption.

Examples of cheap mineral acid—HCl, H₂SO₄

Examples of Fungicides—
naphthols, nitrophenols.

Examples of formulations using the above constituents are given below :

*Some typical formulations of descaling jelly:**Example 1*

100 c. cs. of water are taken in beaker and heated to boiling. In boiling water 100 gms. of ground nut flour are mixed till a pasty mass is obtained. 1 gram of fungicide is added and again mixed. This is followed by the addition of 100 c. cs. of concentrated HCl and mixing till a thick fluid is obtained. Then 30 grams of flour are added and mixed to obtain the rust and scale removing jelly.

Example 2

100 c. cs. of water taken in beaker and heated to boiling. In boiling water 50 grams of "root" flour are mixed till a pasty mass is obtained. Then 1 gram of fungicide added and again mixed. This is followed by the addition of 100 c. cs. of concentrated HCl and mixing till a thick fluid is obtained. Then 50 grams of flour are added and mixed to obtain the rust and scale removing jelly.

The main advantages of the invention:

(1) The performance of the descaling jellies developed by us is shown below in comparison with a well-known and effective remover of rust and scale viz., Hydrochloric acid.

TABLE I

Description of test	HCl	Jelly
Rusted steel brushed and left overnight and cleaned in flowing water with bristle brush	Not removed	Completely removed

(2) *Prevention of attack of base metal by acid present in jelly is illustrated below:*

TABLE II

Description of test	HCl	Jelly
Polished steel is brushed and left overnight and visual observations are made on surface condition	Completely rusted	Remains bright
Polished steel suspended in descaling jelly and HCl solution for one hour	Weight loss is 0.9 gms/12.5 sq. cms.	Weight loss is 0.02 gms/12.5 sq. cms.

(3) *Presence of jelly on the surface of the metal for as long as 24 hours is illustrated in the example cited below:*

TABLE III

Description of test	HCl	Jelly
Rusted steel brushed in the vertical position and left overnight and examined for presence of rust remover	Evaporates	Remains in tact on the surface

(4) *The low cost of the descaling jelly is illustrated below in the case of 3 formulations:*

TABLE IV

Area covered by jelly in the different compositions employed	Total cost of jelly at the prevailing rate Paise
(a) 50 sq., dms.	24
(b) 50 sq., dms.	23
(c) 60 sq., dms.	28

(5) The jelly does not run off the surface on application, and remains in contact with the metal surface for the required time.

(6) Jelly can be washed off the surface with water before painting.

Noteworthy features:

(1) Rust and scale removing jelly formulation based on plant carbohydrate and protein and mineral acid can bring about efficient removal of rust and scale from steel structures, free from inaccessible crevices.

(2) The constituents used in the jelly formulations are available indigenously.

(3) The jelly formulations can be applied to steel structures by brushing.

(4) The jelly formulations prevent attack of base metal and selectively remove rust and scale.

We claim:

1. A rust and scale removing jelly composition which comprises (i) a cheaply available plant product such as ground-nut flour, root flour, maize flour, (ii) a cheap mineral

acid such as CH_3COOH , H_2SO_4 , (iii) a fungicide such as naphthols, nitrophenols and (iv) water.

2. A composition as claimed in Claim 1 wherein the ingredients are used in the following proportions by weight:

Plant product	30-50%
Mineral acids	30-50%
Fungicide	1-2%

3. A process for preparing a composition as claimed in Claim 1 or 2 which consists in mixing the plant product in water, heating to boiling, adding mineral acid and fungicide and mixing well.

4. A rust and scale removing jelly composition comprising a plant product, mineral acid and fungicide substantially as hereinbefore described.

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Patents Officer,

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

Dated this 4th day of May 1967.