Struktol Company of America
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Producers of Specialty Chemicals

RUBBER SERVICE SRL

Antiadherente P

Information Packet

Contents: **Page**

STP0236

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Our Quality Management System has ISO 9001:2008 with Design Certification

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Quality Additives for Performance

Antiadherente P

Antiadherente P is a Batch-Off slab lubricant designed for use in the tire industry, whose formulation is made without inorganic fillers, and displays an excellent behavior when confronted to the adhesion of steel cord compounds through cobalt salts.

Chemical composition: Mixture of insoluble and soluble soaps, principally Calcium, with dispersing agents.

Physical properties:

Melting point:	102 - 112 °C
Acidity Index:	36 - 46
Ash at 950*C:	6.7 - 9.7
Ph (3% in water dispersion):	7.6-10.6

Functionality: Only 1.2 - 1.5 % of the dispersed product in water produces a stable solution of a strong antiadhering effect among mixtures of different types of rubber, without undergoing the problems of having to use powders. It also reduces pollution in the working place.

Characteristics:

- Compatibility with compounds
- Does not interfere with Steel Cord adhesion
- Produces stable dispersions, without precipitation
- It produce low foam
- Non-abrasive since it does not have inorganic fillers
- Low cost
- Forms colorless films adhered to the sheets, without producing pollution
- Biodegradable

Application: It is recommended to disperse the quantity to be used in water at a temperature of 20°C or higher , and stir moderately during one hour. Once the dissolution is produced, stirring may be suspended. In the Batch-Off pan it is not necessary to use neither stirring nor recirculation.

Observations: The very thin anti tack film which deposits itself on the raw mixtures, is totally compatible with rubber, and it does not produce any inconvenience of a lack of adhesion during vulcanization.

Stability: 2 years minimum when stored under normal conditions.

Bags: 25 kilograms

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RUBBER SERVICE SRL

Antiadherente Liquido

Aqueous Dispersion of **Antiadherente P**

This pre-dispersed material presents itself as an appropriate solution for those businesses that do not possess the necessary equipment for the correct dispersion of **Antiadherente P** in water.

The pre-dispersion state of **Antiadherente Liquido** allows a rapid dilution of the concentrations to be used, simply by adding the necessary quantity to water at room temperature and homogenizing it by shaking or stirring gently.

The instructions for use are the same as detailed in the sheet corresponding **to Antiadherente P**.

Properties:

Composition: Aqueous Dispersion of **Antiadherente P**
Concentration: 18 - 22% of solids
Ph: 7.5 – 10.5
Solvent: Water
Viscosity: 0.5 - 2.5 minutes in Glass Fort No 2 to 25º C

Dosage:
The addition of 6% to 12% weight of **Antiadherente Liquido** in water will be sufficient to produce a film that will prevent the sticking of slabs for the majority of the common compounds in the industry.

Observations:

The very fine anti-adherent film that is deposited on the raw mixtures is absolutely compatible with the rubber and does not produce adhesion fault inconveniences during vulcanization.

Packaging:
Antiadherente Liquido is available in drums of 200 kg and cans of 20 kg.

Stability: Approximately 24 months.

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Spray applications

This application method, very common in the past, is being left and replaced by immersion troughs due to the many problems that its use brings, as follows:

1. **Spray nozzles**. The normally tend to plug, this problem is increased when the antitackifiers have inorganic fillers in their formulations producing an additional maintenance cost.

2. **Energy consumption**. They require a continuous operation of a recycle pump, with the consequent energy consumption.

3. **Dirt**. The application area is dampness and dirty due to the spray rain

4. **Foam production**. When the spray rain falls on the collecting trays. This problem can be reduced with grates over the trays.

It is a well known criterion that spray rain systems reduce the compound's temperature better than troughs ones. However this an erroneous criterion, as most of the compound heat is removed by evaporation of the water in their surface, making use of its evaporation heat which is 600 to 800 times grater than the water specific heat, depending on temperature.

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Dispersion Technique

There are two types of antitack materials supplied by Rubber Service:

1. Pure products, in powder
2. Predispersed products, in the form of concentrated liquids

The technique to be used with the **pure products** consists of the following steps:

- Add the necessary quantity of water to the dispersion tank
- Increase its temperature by means of steam, or the available heating system, to the range recommended for the used antitack material.
- Start the agitation
- Star adding slowly the antitack powder over the surface of the water under agitation.
- Continue the agitation up to no particles be observed in laboratory glass vessel. Normally the mixing time is of the order of 45 – 75 minutes, depending on agitation level.
- Interrupt agitation (If the dispersion is correct, the dispersed material don't must precipitate.
- Interrupt the water heating (starting from this moment, the dispersions are stables between room and boiling temperatures.

For **predispersed materials**, the concentration adjustment technique consists of the following steps:

- Add, at room temperature, the necessary quantity of water to the dispersion tank.
- Add the appropriated quantity of predispersed material.
- Start agitation during 10 minutes.
- Interrupt agitation.

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Dispersion Tank

1. Stirrer rotational direction

The rotational direction has to be such that moves the water upwards thru the center of the dispersion tank. In this way the inclusion of air into the water mass is avoided, and thus the corresponding foam generation.

Usually, propellers works with a rotational direction that produces a central water flow downwards, and they generate a vortex that introduces air into the water mass. The rotor direction is reversed by changing, in three phase motors, the position of two of the three cables from the motor electrical supply.

2. Feeding pipes

Not only the preparation water feeding pipes, as the steam ones, if they are used, or the return ones from the Batch-Off trough, has to be always immersed in the water mass, to avoid that a liquid spurt falls over the surface, producing foam.

The best way to optimize this principle is that all pipe that introduce liquid or steam to the dispersion tank, has to have a length enough to get the bottom of the tank with a separation of 2 o 3 cm.

3. Propeller location

The agitator propeller's must be higher enough as to produce in the surface an agitation level that allows a fast humectation of the antitacking powders, but it don't has to throw water upwards or be located on the surface level, as its action in these conditions produces foam.

If it is necessary to adjust the agitation level in the surface, this can be made in a rapid and simple way by adding, in the motor main supply a variable-frequency device, changing in that way the rotor speed.

4. Its use as a sole tank

If there isn't a reserve tank, and the dispersion tank is also used as feeding tank for troughs or Batch-Off sprays, the agitation has to be suspended when the dispersion is completed.

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The reason why the agitation has to be suspended is that, due to the consumption, the liquid level is reduced making it close to the propeller producing a high level of turbulence, reducing the product performance and producing foam and dirt on the working area

Reserve Tank

1. Feeding pipes

As much as the feeding pipes from the dispersion tank, as the return pipes from the Batch-Off trough, has to be always immersed in the water mass, to avoid that a liquid spurt falls over the surface, producing foam.

The best way to optimize this principle is that all pipe that introduce liquid or steam to the dispersion tank, has to have a length enough to get the bottom of the tank with a separation of 2 o 3 cm.

2. Agitation

The antitacking materials produced by Rubber Service SRL produce sufficiently stables dispersions as to don't need permanent agitation, so we suggest to maintain the corresponding equipment already installed, but don't use them, saving energy and avoiding the possible foam generation, very critical problem when the solution level is reduced up to the same level of the working propellers.

3. Its use as a sole tank

In this case follow the corresponding instructions given to the Dispersion Tank.

The reason why the agitation has to be suspended is that, due to the consumption, the liquid level is reduced making it close to the propeller producing a high level of turbulence, reducing the product performance and producing foam and dirt on the working area

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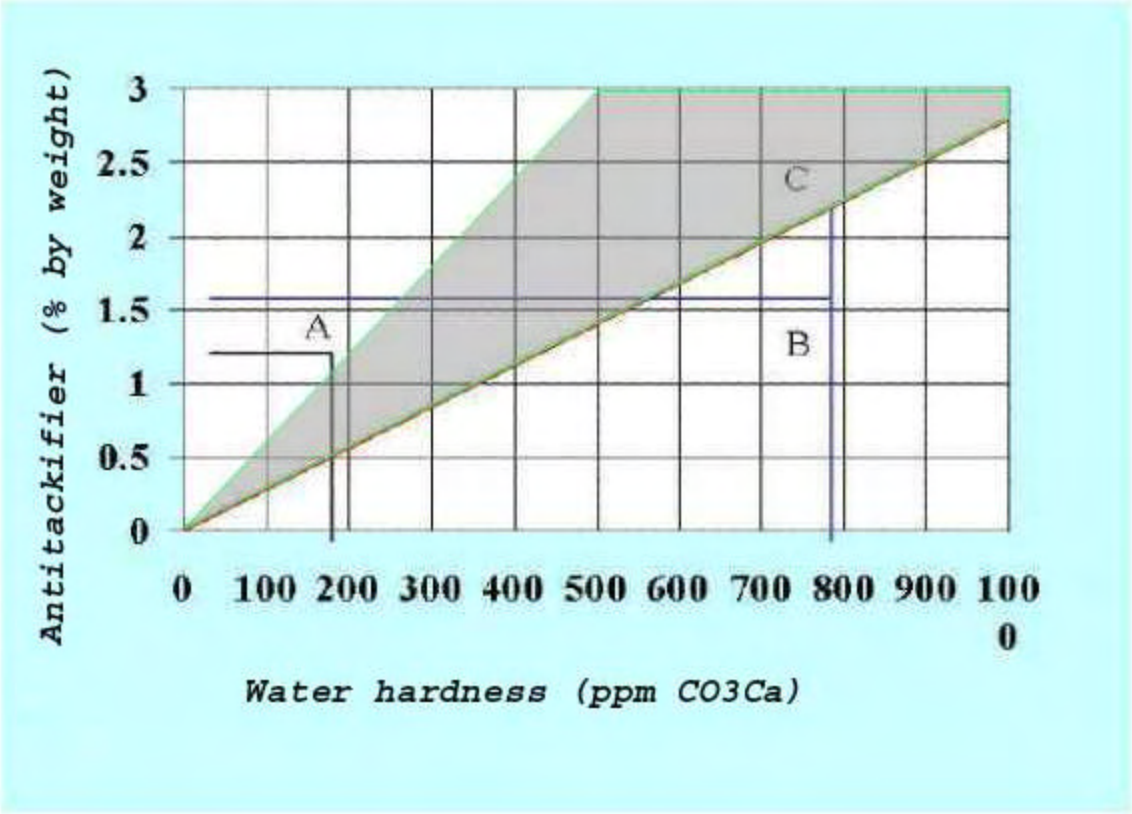
Dispersion water hardness influence

The heavy metallic ions that are present in the water reacts with the dispersion agents anions and produce insoluble salts that capture the electrical charge of the dispersed particles and produce its flocculation.

Rubber Service has developed his antitackifiers with formulations that allows effects of the water hardness, maintaining stables dispersions, provided that, for each hardness it is used the minimum water concentration of antitack material as shown on the following graph:



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As an example, an Antitack P dispersed at 1.25% by weight, used with water with 180 hardness, point A in the graph, will be stable as its located over the red line of minimum concentration points. And a dispersion of 1.6% by weight in water of hardness 780, will tend to flocculate very fast.. With such a hardness waters it must be used a minimum concentration of 2.3% by weight in order to obtain a stable dispersion, as is represented by point C.

For all the antitackifiers mentioned in this paper, the red line can be expressed as:

$$\text{Minimum concentration to be use (\% by weight)} = 0.002799 \times \text{ppm } CO_3Ca$$

These minimum concentrations are only related with the dispersion stability, but are not related to the minimum antitackifier concentration to be used, as it depends of each product.

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Immersion Troughs

There are two basic immersion troughs configurations, as you can see in the attached graphic.

In the **scheme 1**, classic one, there is a unique trough, were the compounds sheets are sinked and impregnated with the antitack dispersion. In this case it is used the same concepts that with the dispersion or reserve tanks, it is, the feeding pipe has to be at 2 or 3 cm from the bottom, to avoid foam production.

In the **scheme 2,** there is a small immersion trough and a lower tank, which acts as a Batch-Off reserve tank.

In both configurations the dispersion level on the trough is controlled by an electrovalve in the feeding line and an electronic level control.

By the use Rubber Service SRL antitack materials, it isn't necessary to stir on the troughs or recycle the solution between them and the preparation tanks, as our products has no tendency to precipitate, and the particles are maintained in suspension by the rubber compounds and transporting bands circulation.

During drying, the material that slips from the sheets is recovered and pumped to the trough. With the piping it is used the same criteria than with the other descripted items. It has to care that the pump never works empty, as it would produce a large foam level.

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Basic Immersion Trough Configurations

Chart 1 – General Configuration

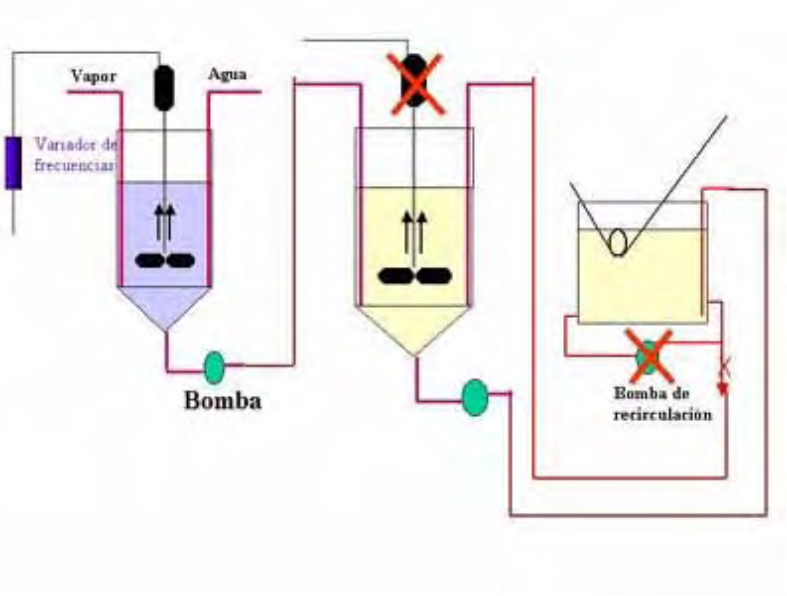
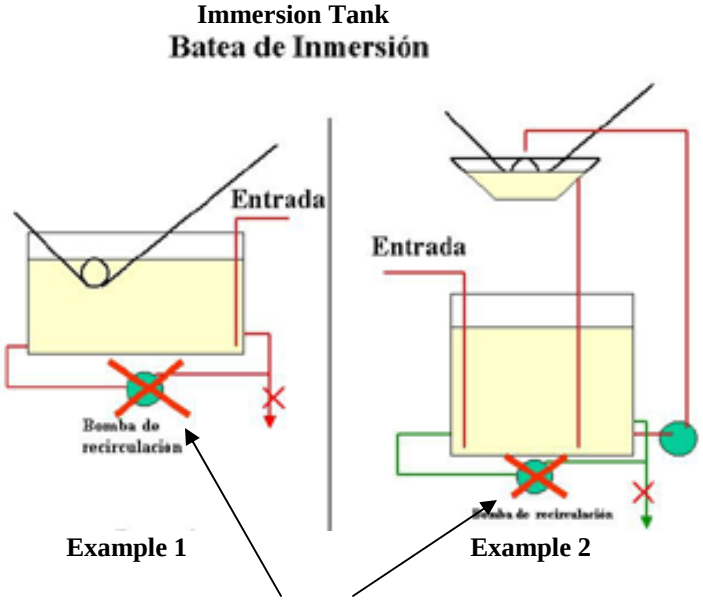


Chart 2 – Detailed Diagrams



Determination of the Minimum Concentration of Solids to Use

Perform the following steps:

1.- Choose the compound that normally presents the more complicated sticky problem in pallets.

2- In the laboratory and in precipitated glasses, prepare antisticking dispersions in the concentration range one wishes to evaluate. For example, if one wishes to evaluate concentrations between 1 and 2%, it will be necessary to prepare dispersions with 1.0 – 1.25 – 1.50 – 1.75 and 2.0% solids.

In the moment to be tested, these dispersions must have a similar temperature than the existing in the Batch-Off trough.

With each one of these dispersions, the following steps must be performed:

3- A piece of the selected compound is, previously heated at those temperature that normally go into the Batch-Off trough is introduced on the dispersion under test and during the time that is maintained there, it is removed and hang up to it is dry and cold. **Trying to repeat the thermal conditions of the immersion trough.**

4- Cut two square pieces of the compound (in our laboratory we use pieces of 4 x 4 cm) taking care of not remove the antitacking material that is over its surface, place one square over the other, similar to two sheets of the compound in the pallet, two metal squares of the same dimension is placed over and under , to have an homogeneous weigh distribution, and a weight or load that fulfill the following conditions:

$$P + p = S \times D \times H$$ where:

P= Weight or load applied on the upper part
p= Weight of the upper metal sheet
S= Compound piece surface
D= Compound density
H= Usual height of the compound in plant pallets

5- Put the whole into an oven at the same temperature that exist in the central part of the mass of a pallet (* see note at the end of the sheet) during a period of 4 hour, remove and let it to cool.

6- Perform an evaluation of the sticking condition between the compound pieces in accordance with the subjective criteria used by your company. Disregard on the evaluation the result obtained on the square edges, that were cut at 90° after immersion.

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Only as a demonstration, we show the following evaluation table and qualification criteria used by our company on this point.

Value	Criteria
1	**The adhesion between sheets is like no antitacking has been applied between them**
2	**There is adhesion between the sheets, but they can be separated with some force**
3	**There is a small adhesion between sheets but they can be separated without force**
4	**There is no adhesion between sheets**

7- By comparing the evaluations on the different dispersions of point 2-, one can specify the minimum antitacking concentration to be used in the plant.

* Rubber compounds are thermal insulators, this is why the sheets temperature taken at Batch-Off outlet has to be taken only as superficial temperature. If a pallet is allow to rest during about 2 hours, we can see an increment of its temperature taken in the center of its mass, this is because of temperature homogenization.

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Solids Control Technique

This simple technique consists in taking a small sample, in the order of 5 g, of the antitack dispersion from the preparation tank, weight it, introduce it in a oven at 105 °C and evaporate the water up to constant weight, cool it and weight it again.

The solids percentage is expressed as:

% solids = Weight dry (final) / Weight moisture (initial)

The sample has to be taken always from the same place (we suggest from the preparation tank), because could exist concentration difference between preparation tank and immersion trough, as in the latter, as general rule, there is water evaporation and a higher concentration.

After years of experience, we found that this simple technique allows one to adjust the plant methodology, and correct preparation mistakes.

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