

# OTR TIRE

## • RETREADING •

# MANUAL



# INTRODUCTION

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Considering the importance of retreaded tyres/tires in off-road applications, this manual refers to the entire OTR tyre/tire retreading process for Vipal Rubber customers, providing an indication of the products' use and how they are applied regarding the autoclave and mold press.

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## CHAPTER 1 - GETTING TO KNOW THE TYRE/TIRE

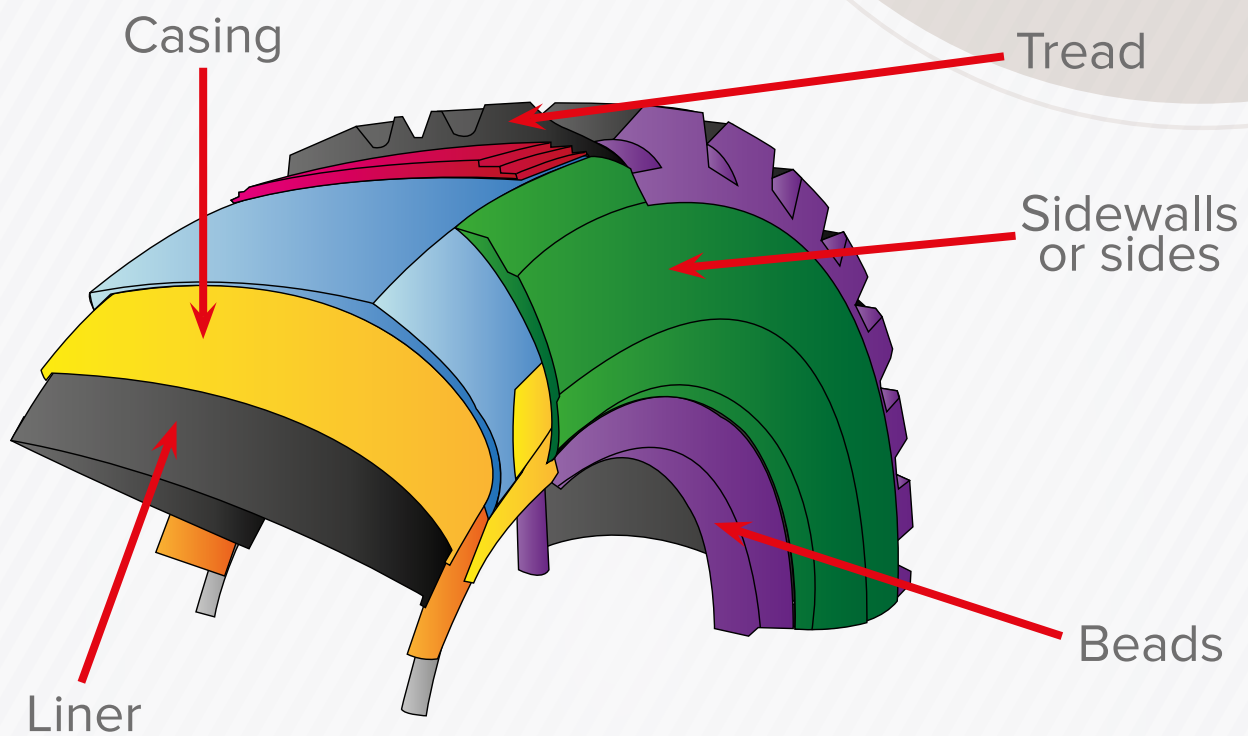
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# GETTING TO KNOW THE TYRE/TIRE

## TYRE/TIRE CONSTRUCTION



**Casing:** Resistant structure formed by a set of plies and eventual protection or working belts.

**Beads:** Tyre/tire part that comes in contact with the rim, ensuring its fixation to it.

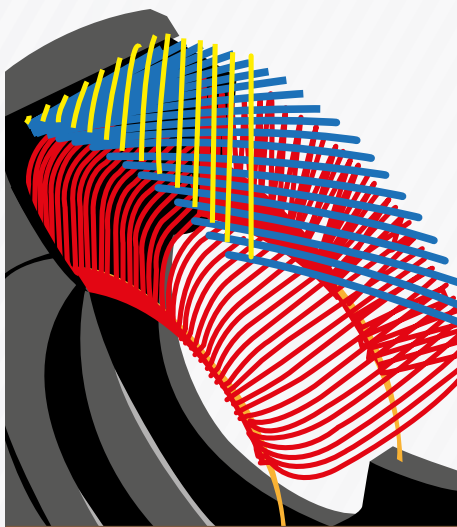
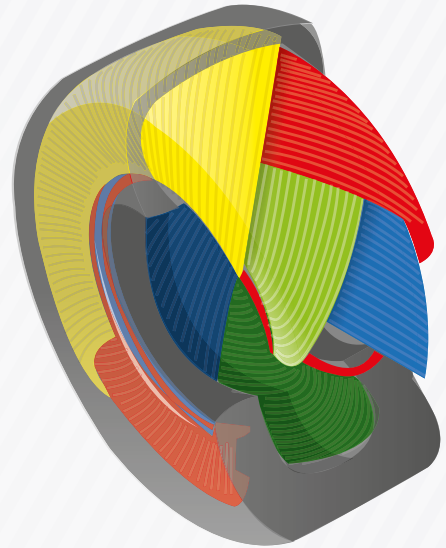
**Sidewalls or sides:** Parts of the tyre/tire understood as the area between the tread and the beads.

**Tread:** Part of the tyre/tire that keeps contact with the ground. Offer wear resistance due to the composition of rubber and special chemical agents. Its carefully studied designs aim to provide good traction, stability and safety.

**Liner:** The layer lining the inside of the tyre/tire. In tubeless tyres/tires, it forms an air-tight seal layer.

# BIAS PLY VERSUS RADIAL TYRE/TIRE

**Bias ply tyre/tire:** tyre/tire whose resistant structure is formed by a set of overlapped textile plies whose cables extend from bead to bead, creating alternated angles in relation to the central line of the tread.



**Radial tyre/tire:** Tyre/tire whose resistant structure is formed by plies whose cables extend from bead to bead, creating angles of about 90° in relation to the central line of the tread. This structure is stabilized by a set of circumferential belts.





The tyres/tires are designed to withstand as much deflection as possible according to the manufacturer's instructions.

#### Tyre/Tire behavior according to build:

- **Radial:** the sides of radial tyres/tires follow operator commands better. They offer greater deflection due to their structure type while maintaining a wider area of contact with the ground.
- **Bias-ply:** the sides of bias-ply tyres/tires present less deflection due to the structure type (more plies used in construction).

## TUBETYPE SET:

**Tube type tyre/tire:** consisting of a tyre/tire and an inner tube mounted on a rim with specific dimensions. Possible components of the pneumatic assembly are:

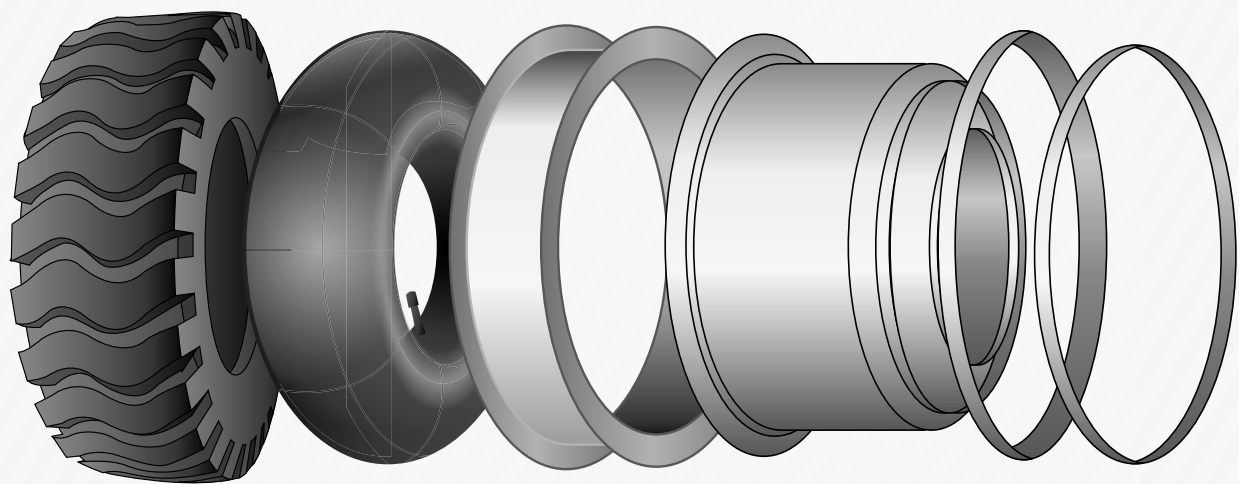
**a) Rim:** Rigid part of the pneumatic set, with determined profile and diameter, destined to support the tyre's/tire's beads.

**b) Inner tubes:** Toroidal-shaped tubes, with valve, whose function is to contain the fluids under pressure of the interior of the pneumatic set.


**c) Tyre/tire:** Part of the pneumatic set that is mounted over a rim and is destined to keep contact with the ground, establishing a link between ground and vehicle.

## TUBETYPE:

- A.** Rim
- B.** Inner tube
- C.** Tyre/Tire







## SET OF TUBELESS TYRES/TIRES:

### **Set of tubeless tyres/tires:**

Constituted by a tyre/tire, with valve, mounted over a rim of determined dimensions and inflated with pressure higher than the atmospheric pressure. The possible components of the pneumatic set are:

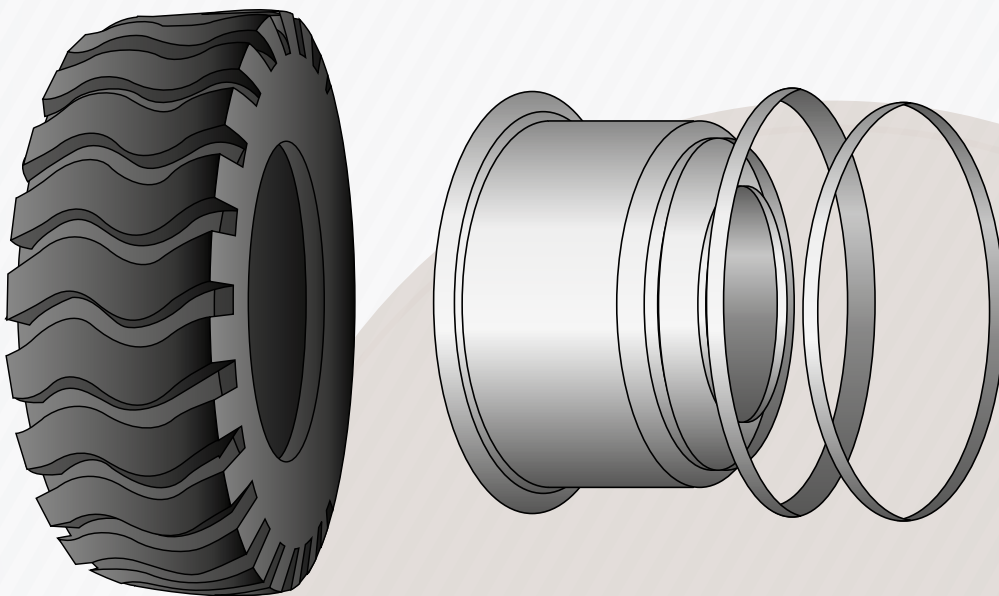
**a) Rim:** Rigid part of the pneumatic set, with determined profile and diameter, destined to support the tyre's/tire's beads.

**b) Tyre/tire:** Part of the pneumatic set that is mounted over a rim and is destined to keep contact with the ground, establishing a link between ground and vehicle.

# TUBELESS TYRES/TIRES:

**A.** Rim

**B.** Tyre/Tire



# UNDERSTANDING THE OTR TYRE/TIRE

The information stamped on the sidewall of a tyre/tire indicates its primary characteristics. The chart below shows an example of the main markings that appear on the sidewall of a tyre/tire.



Marking meanings	4.00-24 G2/L2 12-ply capacity	35/65-33 L-5 30-ply capacity
Manufacturer name and tyre/tire type	VP 1	VP 1
Nominal width of the section in inches	14	35
Technical series	-	65
Structure type	( - ) Bias ply	( - ) Bias ply
Nominal rim diameter in inches	24	33
Load capacity (PR)	12	30
Rotation direction (when applicable)	-	-
Registration	xxx000	xxx000
Type of service	G2/L2	L-5
Speed symbol	NA	NA
Tyre/Tire with inner tube	Tube Type	-
Tubeless tyre/tire	-	Tubless



Marking meanings	35/65 R33 (Tubeless radial steel) Type A X* D2	24.00 R35 Star rating
Manufacturer name and tyre/tire type	Vipal VP 1	Vipal VP 2
Nominal width of the section in inches	35	24
Technical series	65	-
Structure type	( R ) Radial	( R ) Radial
Nominal rim diameter in inches	33	35
Load capacity (PR)	32	**
Rotation direction (when applicable)	-	-
Registration	xxx000	xxx000
Type of service	XRD-Type A	RT - 4A+
Speed symbol	NA	NA
Tyre/Tire with inner tube	-	-
Tubeless tyre/tire	Tubless	Tubless

# GENERAL INFORMATION ABOUT OTR TYRES/TIRES

## “E” TYRES/TIRES FOR LANDSCAPING MACHINERY - “EARTHMOVING”

Code	Pattern	Type of service	MAXIMUM	
			Speed km/h	Distance (cycle) km
E-1	Streaked	Transport	65	8
E-2	Traction	Transport	65	8
E-3	Special drive	Transport	65	8
E-4	Deep tread special drive	Transport	65	8
E-7	Fluctuation	Transport	65	8

## “L” TYRES/TIRES FOR LOADING MACHINES - “LOADER AND DOZER”

Code	Pattern	Type of service	Speed km/h	Distance (cycle) m
L-2	Traction	Loading ramp	10	152
L-3	Special drive	Loading ramp	10	152
L-4	Deep tread special drive	Loading ramp	10	152
L-5	Extra-deep tread special drive	Loading ramp	10	152
L-3S	Rib patter	Loading ramp	10	152
L-4S	Deep tread rib patter	Loading ramp	10	152
L-5S	Extra-deep tread rib patter	Loading ramp	10	152

**“G” TYRES/TIRES FOR LEVELING MACHINES - “GRADER”**

<b>Code</b>	<b>Pattern</b>	<b>Type of service</b>	<b>Speed km/h</b>	<b>Distance (cycle) m</b>
<b>G1</b>	<b>Streaked</b>	<b>Leveling</b>	<b>40</b>	<b>Unlimited</b>
<b>G2</b>	<b>Traction</b>	<b>Leveling</b>	<b>40</b>	<b>Unlimited</b>
<b>G3</b>	<b>Special drive</b>	<b>Leveling</b>	<b>40</b>	<b>Unlimited</b>
<b>G4</b>	<b>Deep tread special drive</b>	<b>Leveling</b>	<b>40</b>	<b>Unlimited</b>

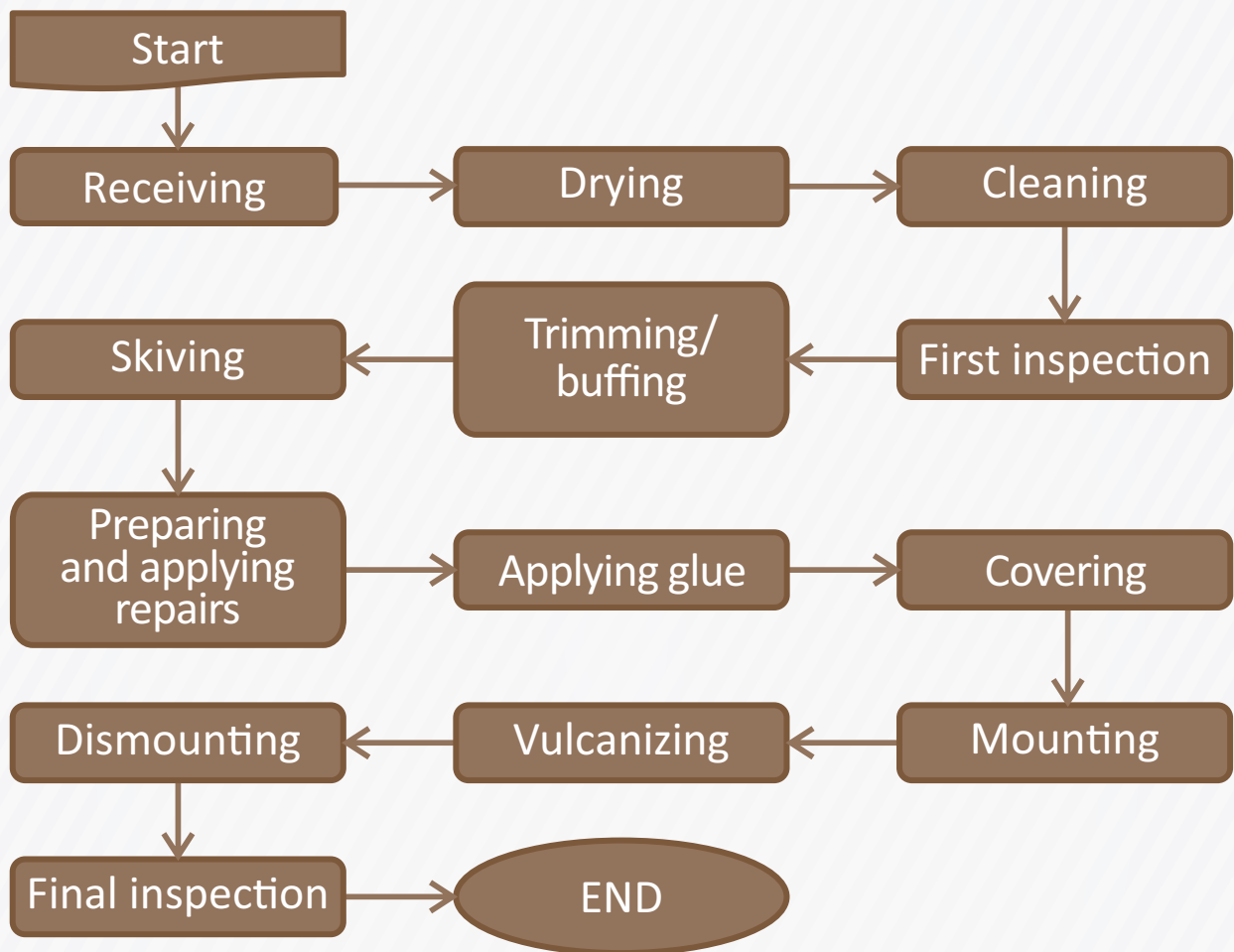
**“C” TYRES/TIRES FOR COMPACTOR MACHINES - “COMPACTOR”**

<b>Code</b>	<b>Pattern</b>	<b>Type of service</b>	<b>Speed km/h</b>	<b>Distance (cycle) m</b>
<b>C1</b>	<b>Rib patter</b>	<b>Compression</b>	<b>10</b>	<b>Unlimited</b>
<b>C2</b>	<b>Grooved</b>	<b>Compression</b>	<b>10</b>	<b>Unlimited</b>



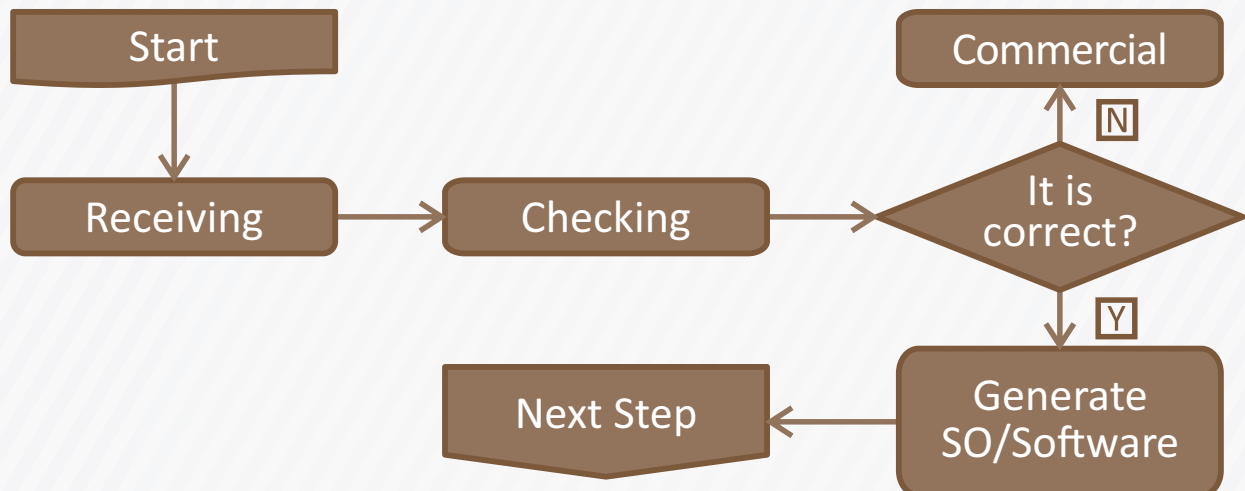
# RETREADING PROCESS

## RETREADING GENERAL FLOWCHART FOR OTR TYRES/TIRES



# RECEIVING AND CHECKING TYRES/TIRES

## RECEIVING AND CHECKING TYRES/TIRES FLOWCHART



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### OBJECTIVE:

Receiving, checking, and storing tyres/tires in covered space, organized and formally recorded.

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### SECTOR:

The receiving department should be spacious and well-lit to facilitate viewing and identification.

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#### **PROCEDURE:**

Perform preliminary tyre/tires analysis and check if the information in the incoming invoice is the same as the ones in the sidewall. See the information that must appear on the tyre/tire:

- identification of manufacturer;
- tyre/tire dimensions;
- tyre's/tire's type of construction;
- registration and/or etched number.

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If the requirements are met in the first item, generate an internal service order for the tyre/tire.

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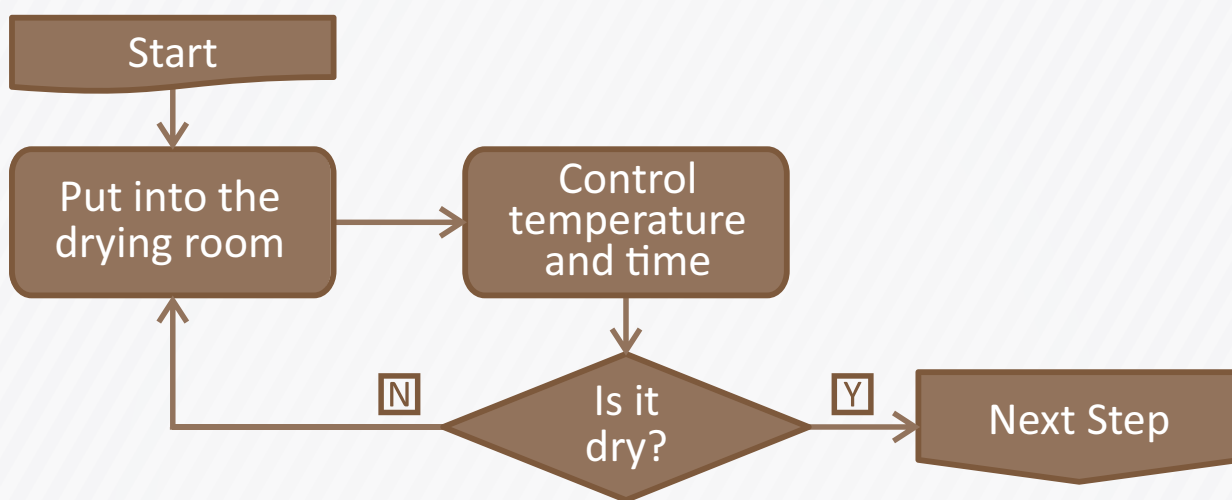
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Store the tyres/tires in covered space, organizing them to facilitate handling.

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# DRYING

## DRYING FLOWCHART



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**OBJECTIVE:**

Drying or eliminating humidity from tyres/tires.

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**SECTOR:**

The drying room must be wide and have controlled temperature and time.

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**PROCEDURE:**

Heat the drying chamber to  $60^{\circ}\text{C} \pm 10^{\circ}\text{C}$ .

Leave the tyres/tires in the drying process for at least 4 hours.

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**EQUIPMENT:**

- Drying chamber, with moisture exhaust.
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**Observation:**

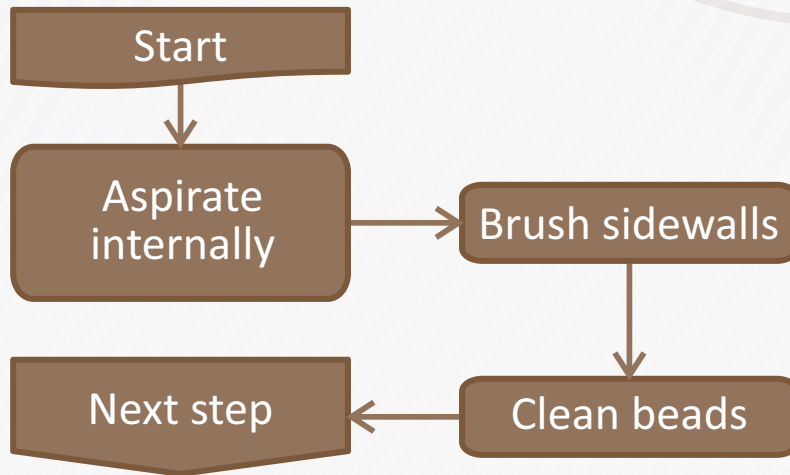
In hotter regions with low air humidity, the chamber is not necessary, but the drying process should be followed.

This stage is not mandatory in the process.

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# CLEANING

## CLEANING FLOWCHART



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### Observation:

If the tyre/tire needs to be washed, this should be done in the receiving stage, followed by drying and then it should go directly to the initial inspection sector.

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### OBJECTIVE:

Perform cleaning to facilitate initial tyre/tires inspection and avoid the contamination of other sectors during the process.

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### SECTOR:

This area should ideally be isolated from other sectors to prevent spreading of dirt.

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**PROCEDURE:**

All dirt must be removed from the internal area, as well as the external area and the bead, as follows:

- Internal dirt should be cleaned via vacuum;
- The sidewalls, beads and tread should be cleaned by brushing or washing.

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**EQUIPMENT:**

- Industrial vacuum cleaner or exhaust system;
  - Manual brush with nylon or steel bristles;
  - High pressure washer.
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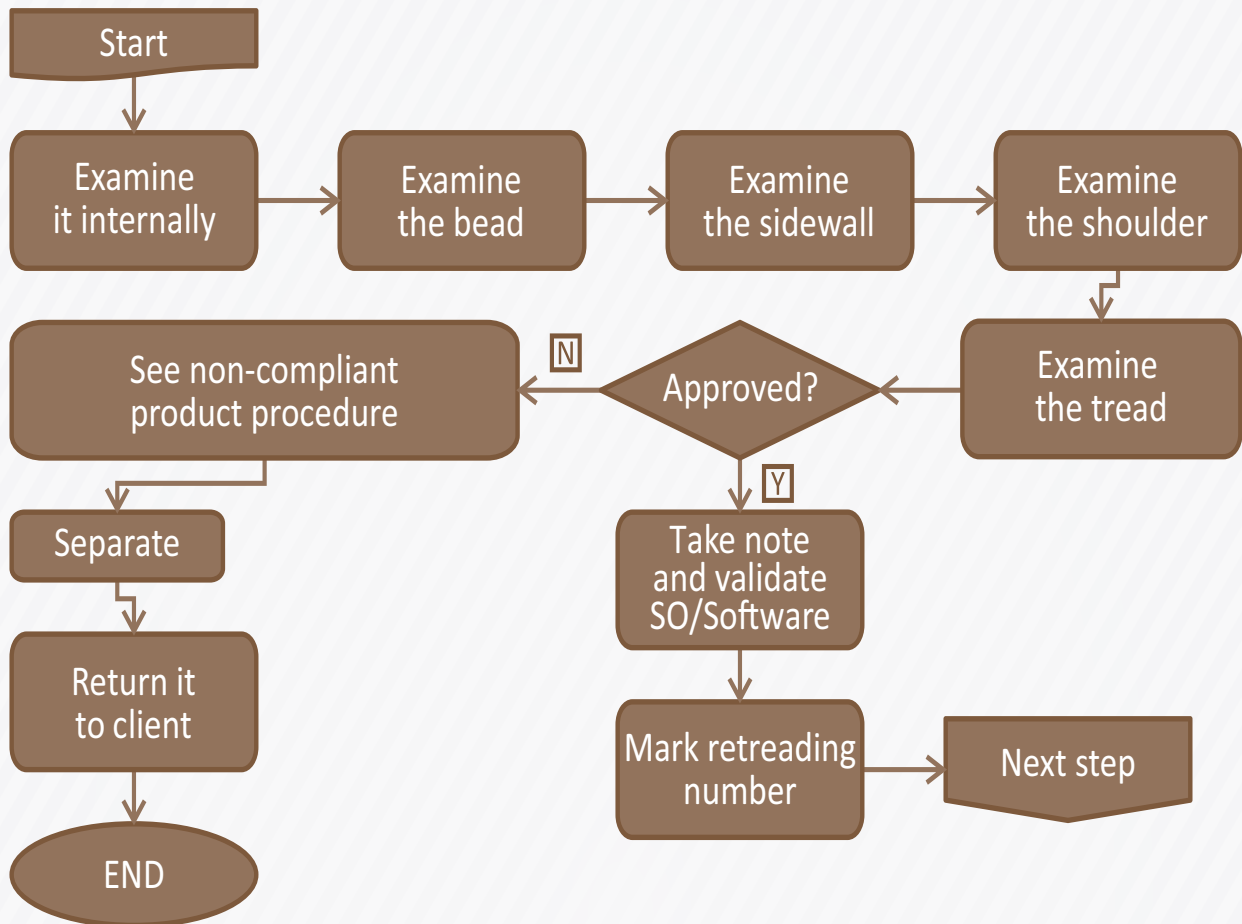


**Observation:**

In case of contamination by oil derivatives, reject the tyre/tire.

# INITIAL INSPECTION AND CLASSIFICATION

## FIRST INSPECTION FLOWCHART



### OBJECTIVE:

Selecting or classifying tyres/tires that are able or not to be retreaded or repaired.

### SECTOR:

The inspection sector must be well lit to facilitate visualization of all damages.



**PROCEDURE:**

The operator must be certain that the previous operations were performed.

In this stage, besides the operator's technical knowledge, a visual evaluation and the use of his hands (tact) are necessary in order to establish contact with the casing's surface. Using the tools (eyes/hands), it is possible to identify blisters or small bubbles, which would not be found with visual or mechanical evaluation only.

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Due to its critical characteristic, it is important to keep a routine and to perform the inspection in five steps:

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### **1 - Internal inspection:**

In the tyre's/tire's internal area, the operator must check:

- Existence of perforation, tyre/tire casing displacement, radial cracks;
- Damages that exceed the limits established in the application of agricultural and OTR repairs sheet;
- Evidence of tread with low pressure, showing folds on the carcass ply or noticeable undulations such as streaks or warps;
- Variations of circumferential color or roughness in the bending area, indicating overheating;
- Tubeless tyres/tires presenting innerliner displacement or openings in the splice;
- Previous repair conditions;
- Inner liner conditions.



### **2- Bead:**

- Check deformations due to incorrect mounting, folds, and broken wire;
- Tyre/Tire showing burnt rubber (degradation) and/or circumferential cracks;
- Tyre/Tire presenting damage in the bead area that affect elements of its structure, such as the casing ply(ies) or the bead rim(s).



### **3- Shoulder:**

- Check, through characteristic color, the existence of possible displacement caused by excessive concentration of heat or impact.





#### 4- Sidewall:

- Check if there are broken plies, displacement, blisters, marks (folds) that indicate run flat;
- Contaminations by hydrocarbons (oils and greases);
- Tyre/tire stress (rubber degraded by several micro cracks).



#### 5- Tread:

- Remove any strange object impregnated in the tread area;
- Check for excessive chipping or irregular wear that may have reached the belt closer to the surface, causing its oxidation or deterioration;
- When examining the tread, possible displacement should be observed.

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**EQUIPMENT:**

- Inspection machine with good lighting, which allows you to turn the tyre/tire.
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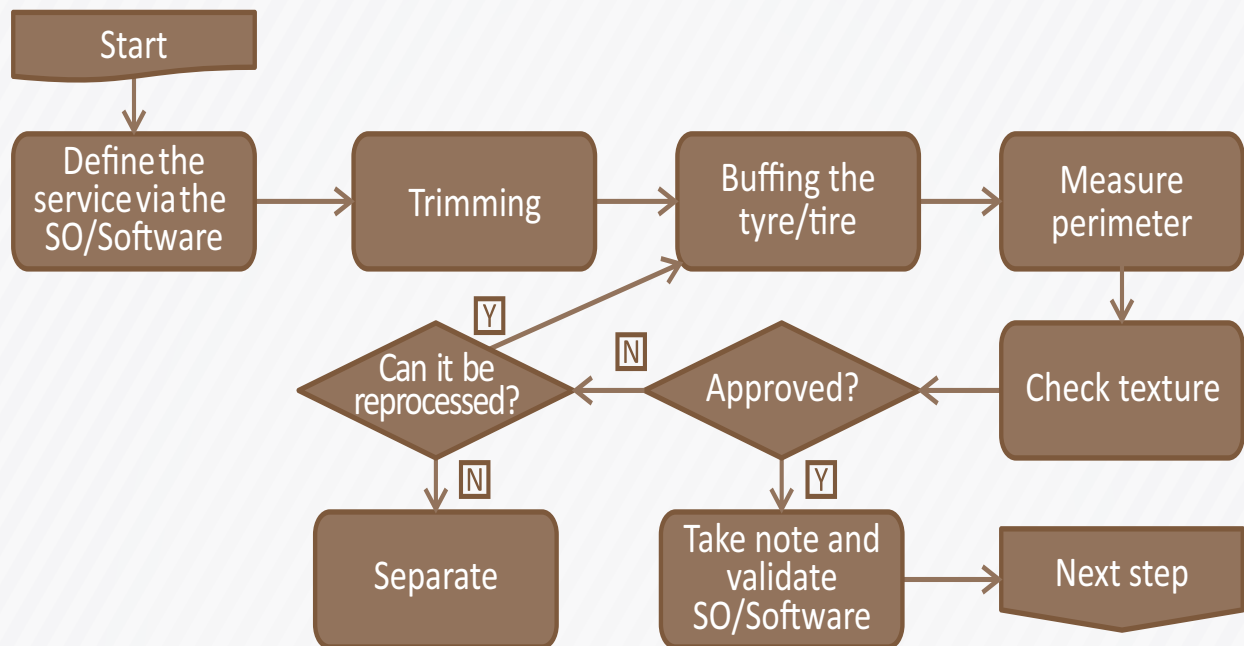
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**TOOLS:**

- Perforation;
  - Plier;
  - Knife;
  - Rubber hammer;
  - Chalk;
  - Low speed turbine between 2500 rpm to 5000 rpm;
  - Ruler;
  - Conical punch.
-

# TRIMMING/BUFFING

## BUFFING FLOWCHART



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### OBJECTIVE:

Remove the remaining part of the tread, leaving the tyre/tire with the proper dimensions (according to the size of matrices) and textures for applying the new tread.

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### SECTOR:

Ideally wide, with adequate lighting and exhaust system for dust and smoke.

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**PROCEDURE:**

- Inflate the tyre/tire to reach uniformity when buffing (15 to 20lbs);
- Check whether the beads are properly laid;
- If necessary, trim the tyre/tire, preparing the casing for buffing.



Buff the tyre/tire always from the hump toward the sides, ensuring that at the end the sub-tread offers a sufficient rubber base for adhesion and protection of the nylon plies and/or steel belts.



Advance carefully with each advancing so that the rubber is not burned. Excessive heating caused by great advances or older buffing blades cause superficial degradation of the rubber, which makes the adhesion of the cushion gum difficult.



Measure the perimeter with a measuring tape, a mechanical measurer, or laser. This will ensure that the tyre/tire meets the matrix size, according to the reference tables.



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### IMPORTANT

Measure the hump and sides perimeter to make sure the buffing has been done evenly.

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Note the perimeter of the buffed tyre/tire on the service order or register it in the software.

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### Observation 1:

It is essential that the buffed surface be clean and with the correct texture to allow great adherence of the new tread. The ideal texture must be similar to the RMA5 or RMA6 standard.

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**Observation 2:**

During buffing, damages not previously detected in the initial inspection can appear, such as excessive chipping, tyre/tire displacement, some times, the tyre/tire needs to be rejected.

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**EQUIPMENT:**

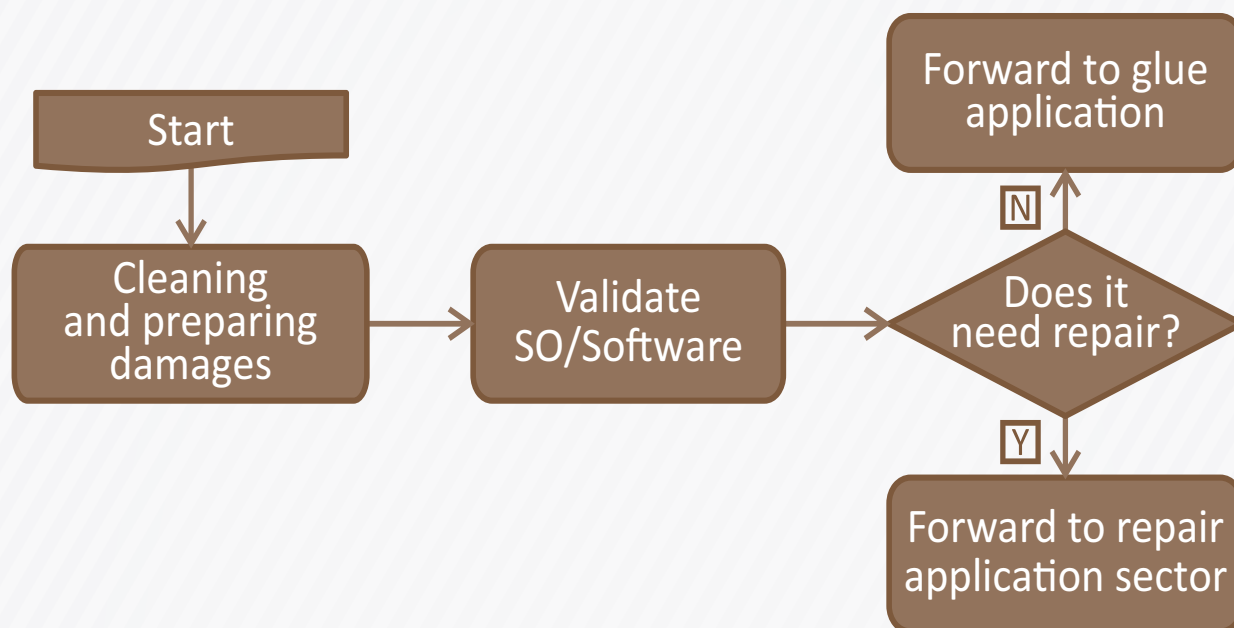
- Machine for trimming and buffing tyres/tires;
  - Circumferential measurer;
  - Low speed electric or pneumatic grinder (whip), between 2500 rpm to 3500 rpm.
- 

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**TOOLS:**

- |                   |                         |
|-------------------|-------------------------|
| • Tungsten discs; | • Awl;                  |
| • Buffing blades; | • Front cutting pliers; |
| • RMA table;      | • Chalk;                |
| • Measuring tape; | • Knife.                |
| • Rubber hammer;  |                         |
-

## SKIVING FLOWCHART



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### OBJECTIVE:

Clean and prepare the damages that affected the tyre/tire, whether on the sidewall, shoulder or tread.

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### SECTOR:

This should be done in equipment that allows for spinning the tyre/tire for preparing the skives, with good lighting and a dust and smoke exhaust system.

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**PROCEDURE:**

Turn the tyre/tire and identify damages to be skived.







With the help of a rubberized brush or a tapered spout, remove the rubber in the damaged area. Skive the damage in a concave way, removing the loose rubber, preparing the damage so to avoid straight or too open angles that hamper the filling's anchorage.



Remove the rubber and the loose plies/belts with a whip or a low rotation turbine with the help of a rubberized brush or tungsten disk or a circular saw. Tools with 2.500 rpm and 3.500 rpm are recommended.



Remove the burnt rubber from the skived area with the aid of a steel brush (for tyres/ tires with steel belts) or tungsten ball pin.

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Evaluate the need for application of repairs (patches). If necessary, the tyre/tire must be sent to the sector of repair application or to the sector of glue application.

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**Observation 1:**

Be careful to remove only what is loose or oxidized. The adhesion of rubber with rubber will always be better than rubber and nylon, or rubber and steel. However, the choice of tools must consider the damage. Limit the skiving area and extension to a minimum.

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**Observation 2:**

Compressed air contains impurities such as oil, water, and metal detritus from the pipe line. Thus, using it for cleaning the tyres/tires is not recommended. Prefer the nylon brush.

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**EQUIPMENT:**

- Low rotation electrical grinder (2.500 to 3.500 rpm);
  - High speed pneumatic turbine (18,000 rpm to 22,000 rpm);
  - Support for skiving.
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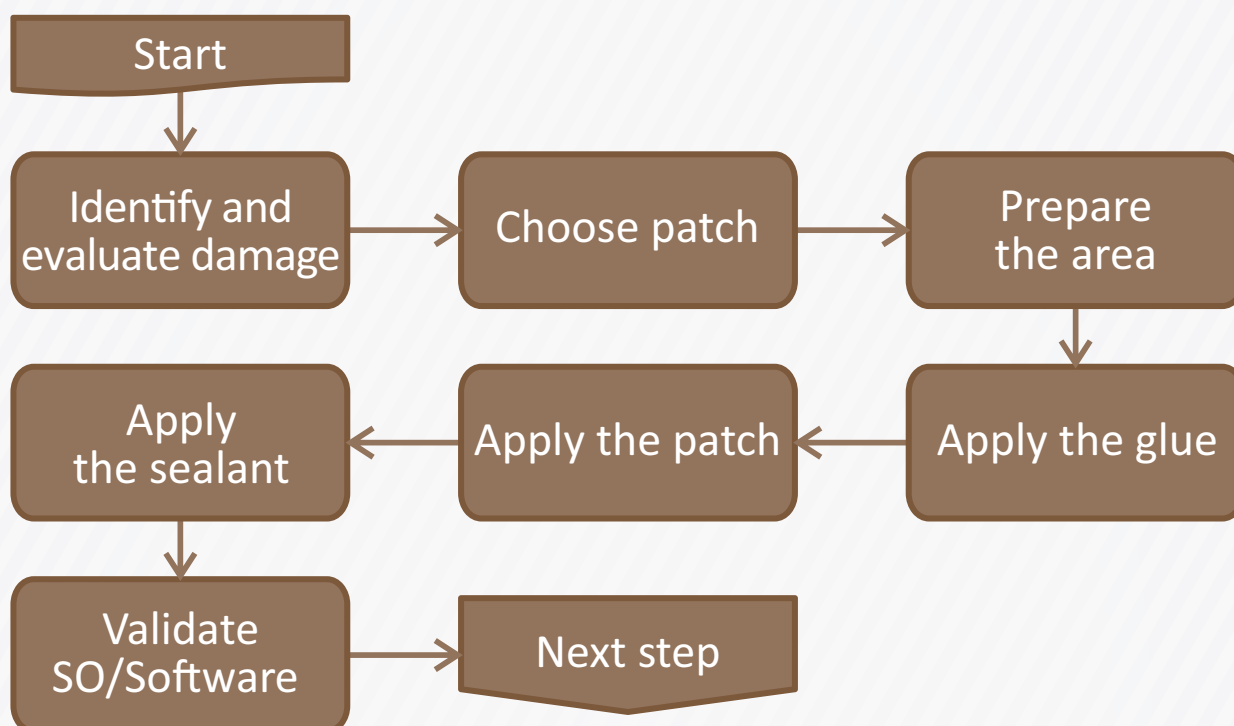
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**TOOLS:**

- |                           |                             |
|---------------------------|-----------------------------|
| • Awl;                    | • Conical punch;            |
| • Cutting pliers;         | • Tungsten gauge;           |
| • Assembled ends;         | • Tungsten ball pin;        |
| • Rubberized steel brush; | • Nylon brush for cleaning; |
| • Tungsten disk;          | • Saws.                     |
| • Tungsten pencil;        |                             |
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# PREPARING AND APPLYING REPAIRS

## PREPARATION AND APPLICATION OF REPAIRS FLOWCHART



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### OBJECTIVE:

Return the tyre's/tire's damaged area the same resistance.

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### SECTOR:

Well lit, with support for opening the patches, dust aspiration system, and cabinets for storing patches, glues, and accessories.

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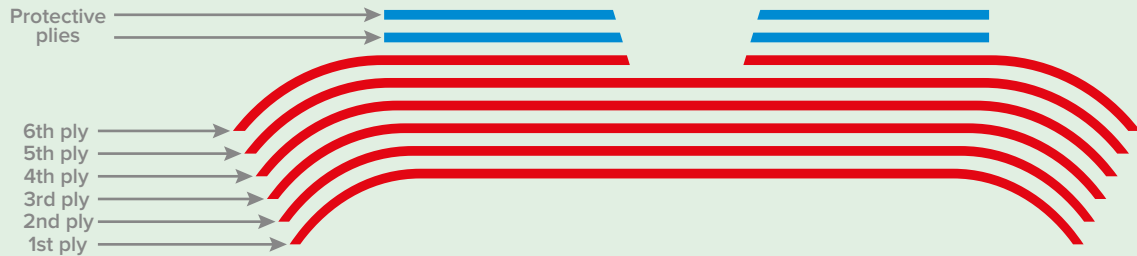
## Patch selection - bias-ply tyre/tire

To select a patch, you have to know the tyre's/tire's ply capacity.



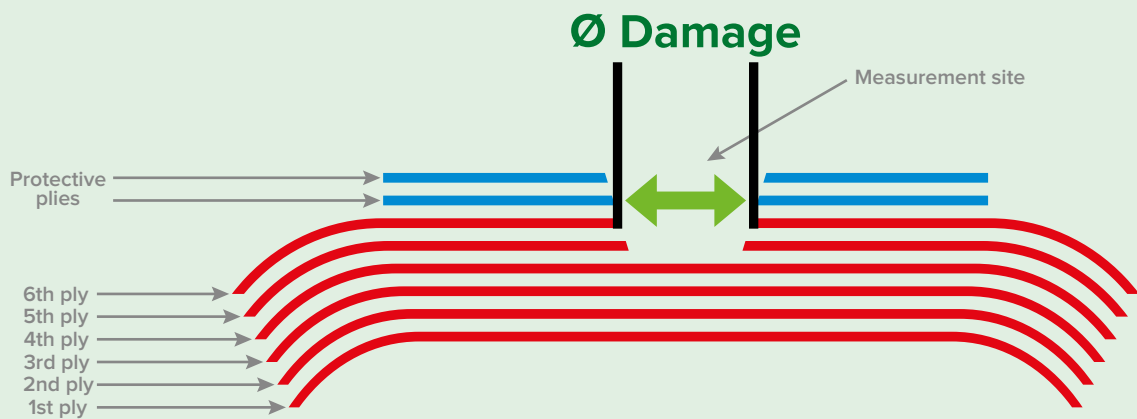
Damages should be measured on the first outer ply, disregarding the protective plies.

## Non-structural damage



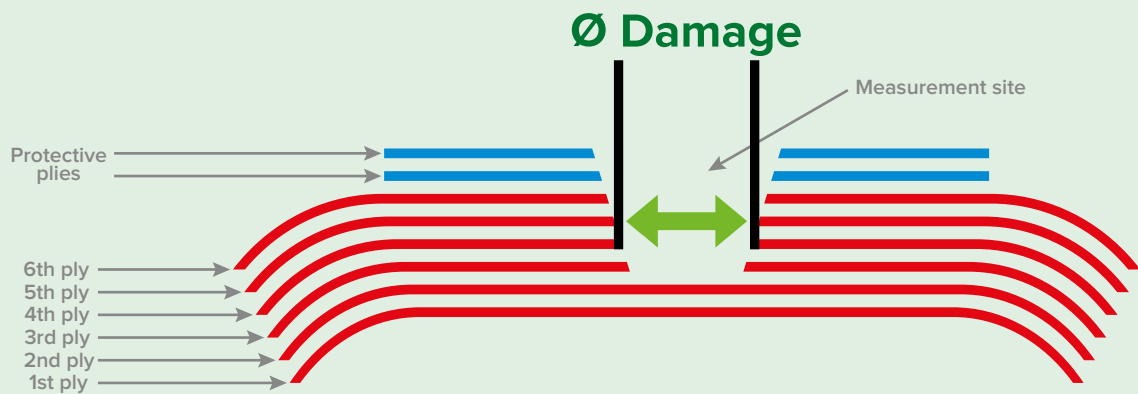
Non-structural damages occur when they affect 25% or less of the main structure.  
(Except protective plies)

## Non-piercing damage



Non-piercing damages occur when 25% to 50% of the main structure is affected.  
(Except protective plies)

## Damage considered piercing




Piercing damages occur when 50% or more of the main structure is affected.  
(Except protective plies)



# Choice of VT patches

For understanding the sheets and choosing the correct patch, we will use an example to demonstrate the selection logic. Let's consider a 17.5-25 tyre/tire with a 100 mm damage on the tread.

Bias ply landscaping tires		PIERCING DAMAGES											
		D (max.) mm											
Pliers capacity		15	25	50	75	100	125	150	175	200	225	250	
	10-16	250	250	250	250	252	252	254	254	-	-	-	
	16-20	250	250	250	251	252	253	254	254	254	-	-	
	22-26	250	250	250	252	252	253	254	254	256	256	256	
	28-32	250	251	251	252	253	254	255	255	257	257	257	
	34-38	251	251	252	252	254	255	255	257	259	259	258/252	
	40-44	251	251	252	253	255	257	256/252	257/252	257/252	258/254	258/254	
	46-50	251	251	253	254	256/253	256/253	257/254	258/254	258/256	259/256	260/256	
	52-58	251	252	254	255	256/253	257/254	257/254	258/254	259/256	260/256	260/258	
60		251	252	254	256	256/253	257/255	258/256	259/256	260/257	260/257	260/258	

1

Tyre/tire measures:  
Tire/tyre 17.5-25

12-ply capacity

Bias ply landscaping tires		PIERCING DAMAGES											
		D (max.) mm											
Pliers capacity		15	25	50	75	100	125	150	175	200	225	250	
	10-16	250	250	250	250	252	252	254	254	-	-	-	
	16-20	250	250	250	251	252	253	254	254	254	-	-	
	22-26	250	250	250	252	252	253	254	254	256	256	256	
	28-32	250	251	251	252	253	254	255	255	257	257	257	
	34-38	251	251	252	252	254	255	255	257	259	259	258/252	
	40-44	251	251	252	253	255	257	256/252	257/252	257/252	258/254	258/254	
	46-50	251	251	253	254	256/253	256/253	257/254	258/254	258/256	259/256	260/256	
	52-58	251	252	254	255	256/253	257/254	257/254	258/254	259/256	260/256	260/258	
60		251	252	254	256	256/253	257/255	258/256	259/256	260/257	260/257	260/258	

2

Type of damage:  
Piercing damages

### Bias ply landscaping tires



#### PIERCING DAMAGES

	Pliers capacity	D (max.) mm										
		15	25	50	75	100	125	150	175	200	225	250
	10_94	250	250	250	250	252	252	254	254	-	-	-
	16_20	250	250	250	251	252	253	254	254	254	-	-
	22_26	250	250	250	252	252	253	254	254	256	256	256
	28_32	250	251	251	252	253	254	255	255	257	257	257
	34_38	251	251	252	252	254	255	255	257	259	259	258/252
	40_44	251	251	252	253	255	257	256/252	257/252	257/252	258/254	258/254
	46_50	251	251	253	254	256/253	256/253	257/254	258/254	258/256	259/256	260/256
	52_58	251	252	254	255	256/253	257/254	257/254	258/254	258/256	260/256	260/256
	60_	251	252	254	256	256/253	257/255	258/256	258/256	260/257	260/257	260/259

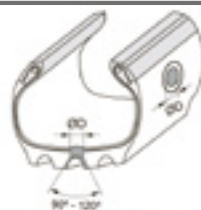
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Damage size:

Ø - 100mm

Measure the damage dimension and identify it in the table.

### Bias ply landscaping tires



#### PIERCING DAMAGES

	Pliers capacity	D (max.) mm										
		15	25	50	75	100	125	150	175	200	225	250
	10_94	250	250	250	250	252	252	254	254	-	-	-
	16_20	250	250	250	251	252	253	254	254	254	-	-
	22_26	250	250	250	252	252	253	254	254	256	256	256
	28_32	250	251	251	252	253	254	255	255	257	257	257
	34_38	251	251	252	252	254	255	255	257	259	259	258/252
	40_44	251	251	252	253	255	257	256/252	257/252	257/252	258/254	258/254
	46_50	251	251	253	254	256/253	256/253	257/254	258/254	258/256	259/256	260/256
	52_58	251	252	254	255	256/253	257/254	257/254	258/254	258/256	260/256	260/256
	60_	251	252	254	256	256/253	257/255	258/256	258/256	260/257	260/257	260/259

4

Then, identify the patches' options indicated for the damage.

Indicated patches:  
VT 252

## Procedure for applying the patch

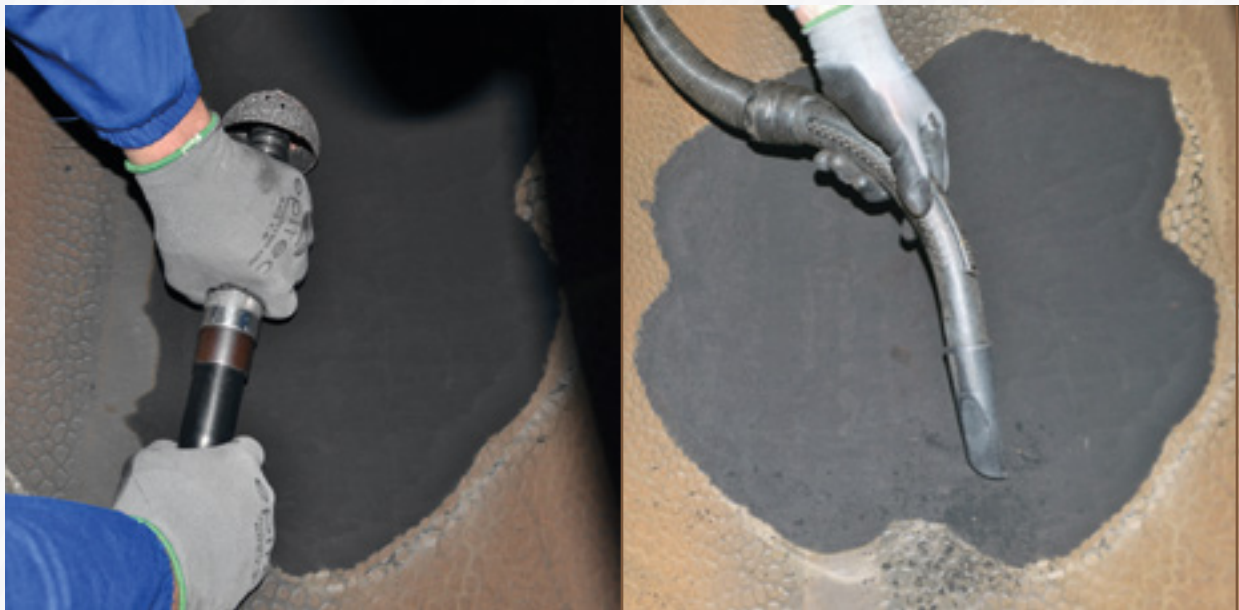


Clean the area with Bufpal surface activator.



Keep the tyre/tire in normal position, without opening the beads. Position the template or patch at the center of the damage and mark the outline with chalk.





To prevent contamination and preserve the inner plies, only the demarcated area should be carefully trimmed using a fine grain carbide grinder at 2,500 to 3,500 rpm.

The texture of the buffed area should be RMA1 or RMA2.

Remove the rubber dust from the buffed area with a fine brush and/or vacuum cleaner in order to obtain a clean and dry surface.



Use the Bufpal surface activator to clean the area. Don't use compressed air.





Apply vulcanizing cement to the area to be repaired, waiting for the cement to dry properly. Don't use devices for drying and avoid direct contact with the previously prepared area.

**Attention: DON'T USE** flammable cement near flame, spark or other ignition source.

---

**Note:**

For hot repairs, use Vulk cement and hot patch, following the same procedure.

---



Remove the protective film from the patch from the hump to the edges, leaving room to hold the repair and prevent base contamination.



The patch should be applied with the beads in original position, not opened. Align the patch according to the demarcated area, keeping the indication arrows toward the beads.



Roll the patch from the hump to the edges, ensuring better adhesion and preventing air occlusion.





Apply sealant at the edges of the patch, covering the buffed area and protecting the patch from possible infiltration.


Finally, allow the sealant to dry according to the instructions of the packaging.




When vulcanizing occurs in a direct steam autoclave instead of applying sealant to the patch edges, it is recommended to apply a layer of Vulk glue and then cover it with calendered material, MB/AC bond or Shoulder Veneer.

## Patch selection - radial tyres/tires


For understanding the sheets and choosing the correct patch, we will use an example to demonstrate the selection logic. Let's consider a 24.00R35 tyre/tire with a 90 mm damage on the tread.



Rim 29 to 35




### RADIAL TIRES




Ø B (mm)	RAC
8	20
25	44
35	35
40	46
55	50
65	55
80	52
90	65
105	56
120	75

**Tyre/tire measures:**  
24.00 R 35


1



Rim 29 to 35



### RADIAL TIRES





Ø B (mm)	RAC
8	20
25	44
35	35
40	46
55	50
65	55
80	52
90	65
105	56
120	75

**Damage position:**  
Tread

2





 Rim 29 to 35 	RADIAL TIRES	
	Ø B (mm)	RAC
	8	20
	25	44
	35	35
	40	46
	55	50
	65	55
	80	52
	90	65
	105	56
	120	75

3

**Damage size:**

Ø - 90mm

Measure the damage dimension and identify it in the table.

 Rim 29 to 35 	RADIAL TIRES	
	Ø B (mm)	RAC
	8	20
	25	44
	35	35
	40	46
	55	50
	65	55
	80	52
	90	65
	105	56
	120	75

4

Then identify the options of patches indicated for the damage.

**Indicated patches:**

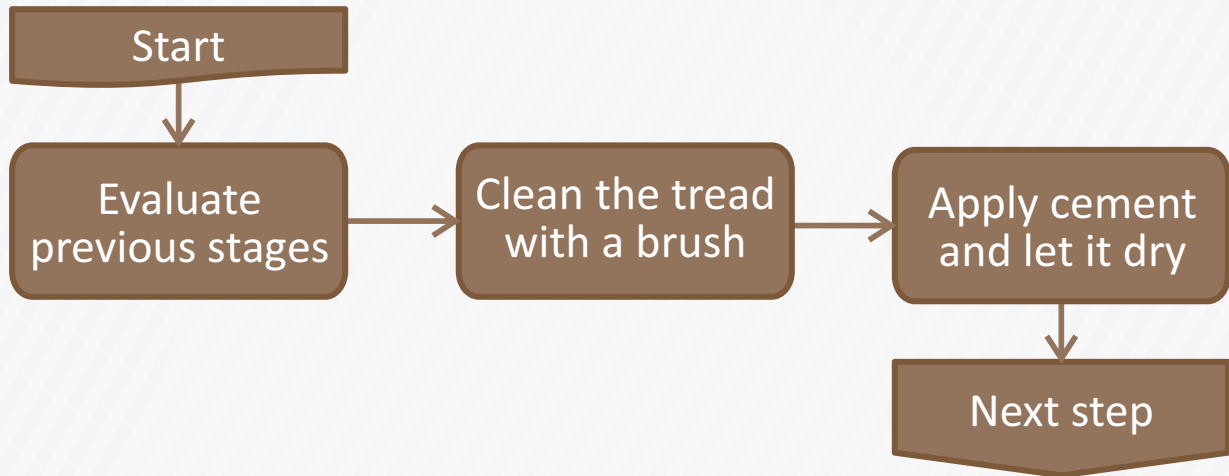
RAC 65

## Procedure for applying the patch

For applying the RAC patch, follow the same instruction for applying VT patches.

# APPLYING THE GLUE

## APPLYING THE GLUE FLOWCHART



---

### OBJETIVE:

To reexamine the previous steps.

Ensure the necessary adhesion between the tyre/tire and the Camelback to allow its fixation until the assembly is heat-cured.

Protect the buffed area of the tyre/tire from oxidation.

---

---

### SECTOR:

Environment with exhaust and good ventilation without contamination by dust and presence of humidity.

---

---

### PROCEDURE:

Evaluate whether the preceding steps were completed properly.

---

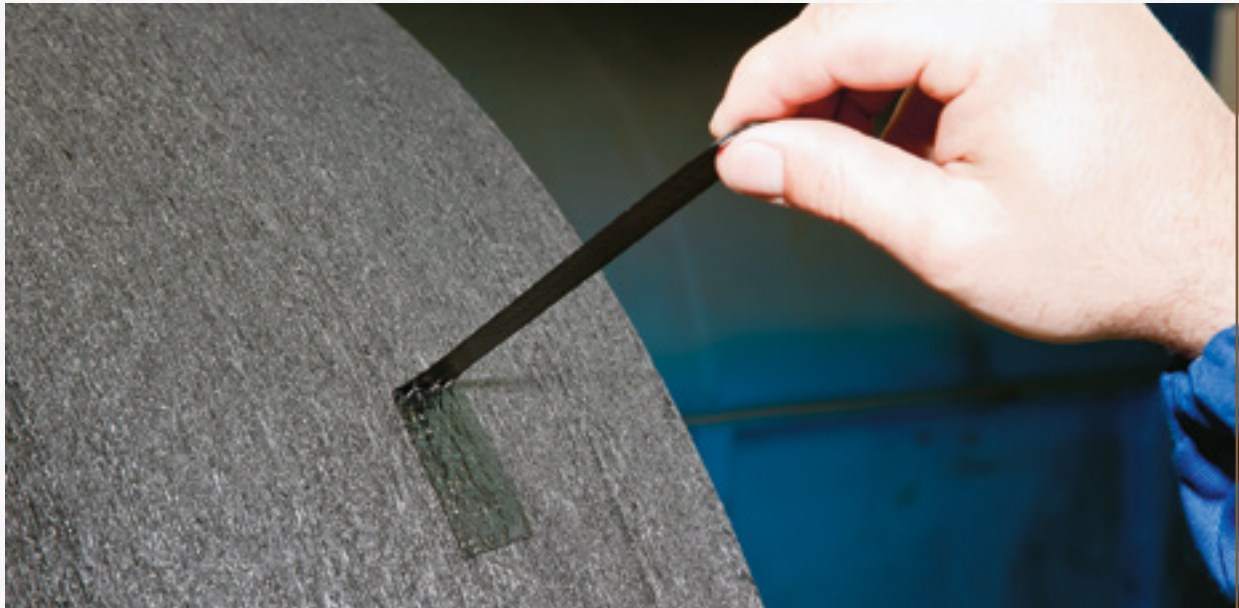


Clean the tyre/tire with a soft brush (nylon) and clean the inside with a vacuum cleaner if necessary.



Apply a thin and even layer of cement.  
After applying the cement, check for the existence of product build-up. If found, spread it over the area with a paint brush.





Check the complete drying of the glue before continuing the retreading process.

Drying time varies according to the temperature and relative air humidity.

Thus, each retreader must establish standards according to local climate conditions.

To ensure that the cement is dry, test its tackiness with a piece of rubber Cushion MB/AC or Vipal shoulder stripping gum of about 4 cm wide by 10 cm of length, observing the following procedure:

- Roll 50% of the Cushion sample length over the buffed surface with cement;
- Remove the plastic protector. At a 90° angle, pull the Cushion. If it offers resistance and the cement stretches, it is ready to proceed to the next step.
- If the Cushion detaches from the area easily when pulled, the drying time should be extended.

---

#### **Observation 1:**

After this stage, it is necessary to be careful so that the surface onto which cement was applied is not contaminated by the touch of hand or any object and neither rolls over the floor..

---



---

**Observation 2:**

After cementing, the tyre/tire must receive the coverage in a maximum period of 2 hours. After this period, the cement must be reapplied.

---

---

**Observation 3:**

In regions where the temperature goes lower than 12°C and humidity above 90%, we recommend the controlled use of a tunnel for drying cement, observing the following parameters:

- Tunnel temperature: 35°C ( $\pm$  5°C);
  - Permanence time of the tyre/tire in the tunnel: 20 minutes.
- 

---

**EQUIPMENT:**

- Trestle with automatic swivel;
  - Glue pulverizing pump;
  - Drying tunnel;
  - Cabin for glue application with exhaust system;
  - Vacuum cleaner or exhaust system.
- 

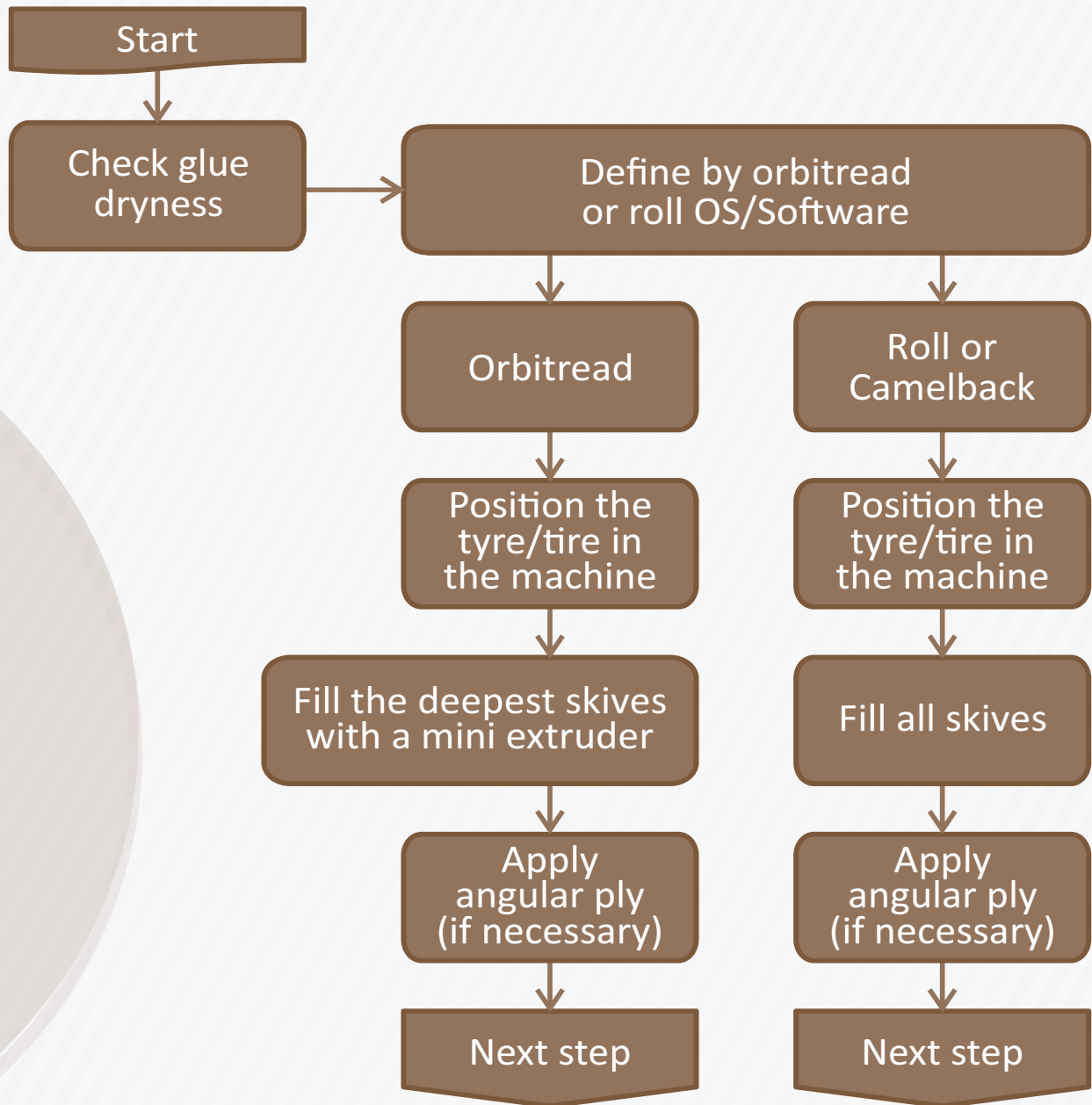
---

**TOOLS:**

- Paintbrush;
  - Spray nozzle.
-

# FILLER WITH GUM

## FILLING FLOWCHART



### OBJECTIVE:

To fill in skived damages, leveling them with the tyre's/tire's surface.

---

**SECTOR:**

Well-lit and free of impurities.

---

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With the tyre/tire positioned on the stitcher, inflate it to a pressure of 15 to 20 psi, keeping it centered on all planes (vertical and horizontal).

---



If there are large fills, we recommend using cotton yarn that will perform the wicking function.



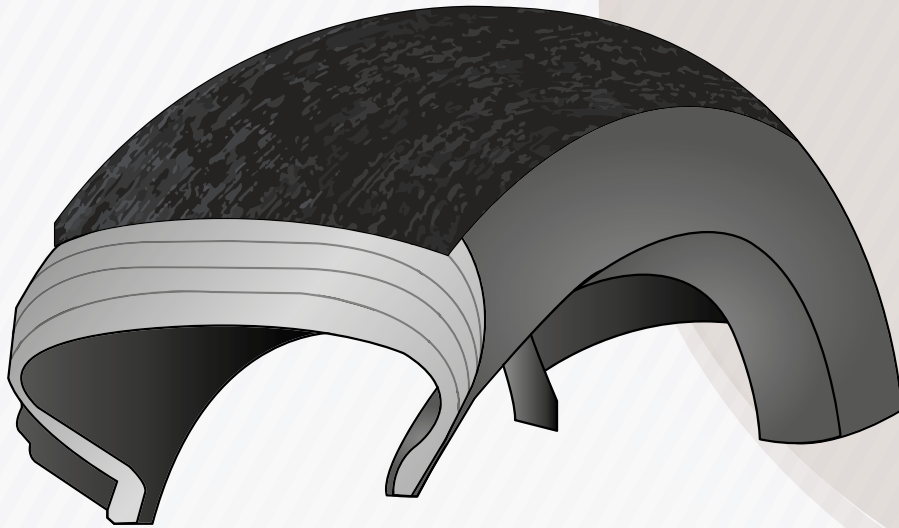


With an extruder heated to  $75^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , fill the skives with Cushion gum, leaving no more than 1 to 2 mm excess above the tyre/tire level.  
The same is true for the sidewall.

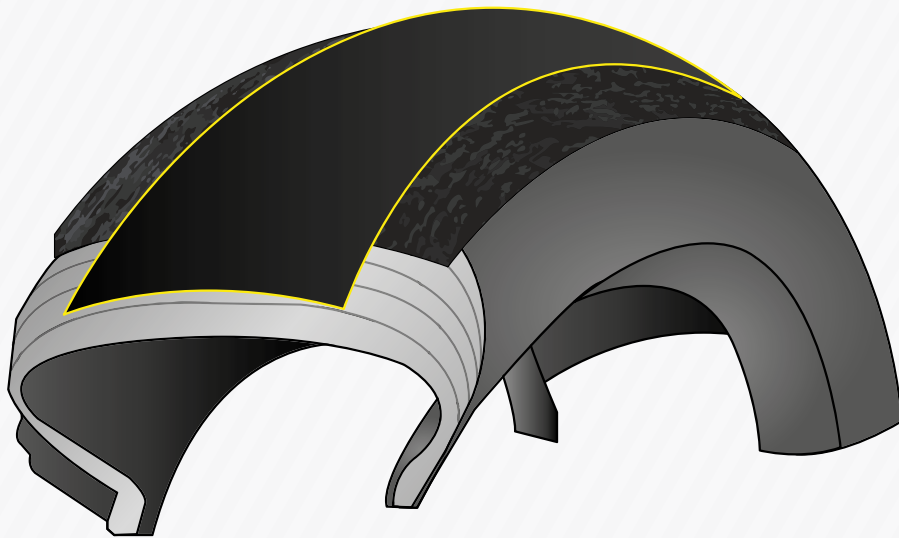


In large skiving or when choosing not to use the mini extruder, the fillers can be made manually with MB/AC rubber to coat the skiving and then fill it with OTR binding.

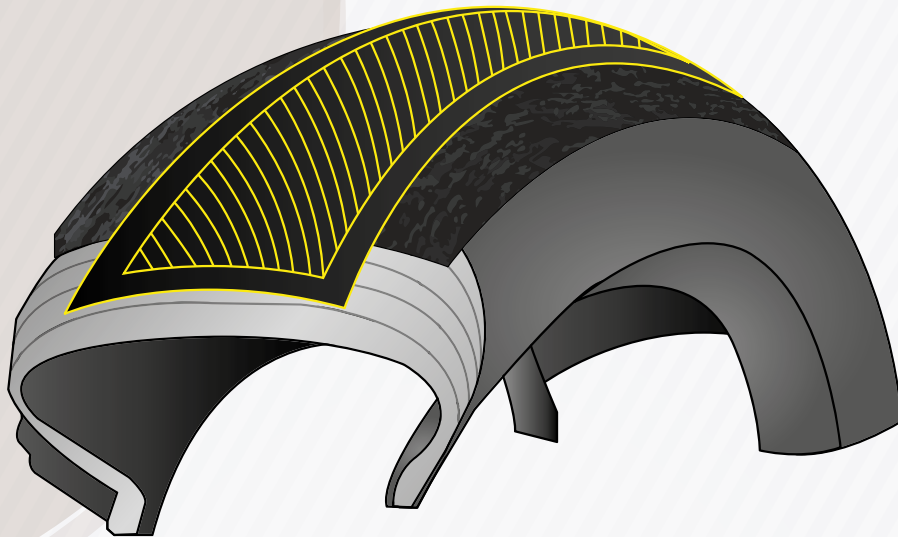




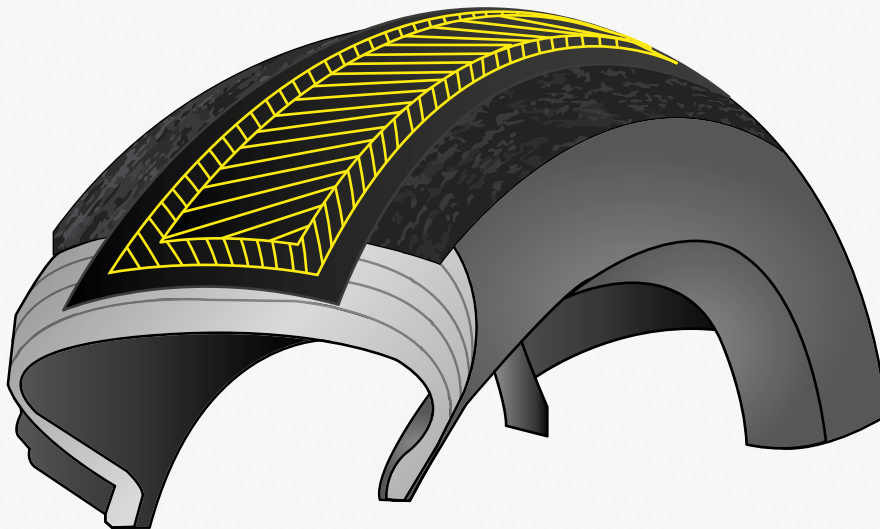
If the casing is damaged, with excessive pricks, exposed or worn plies, the application of rubberized nylon ply is recommended.



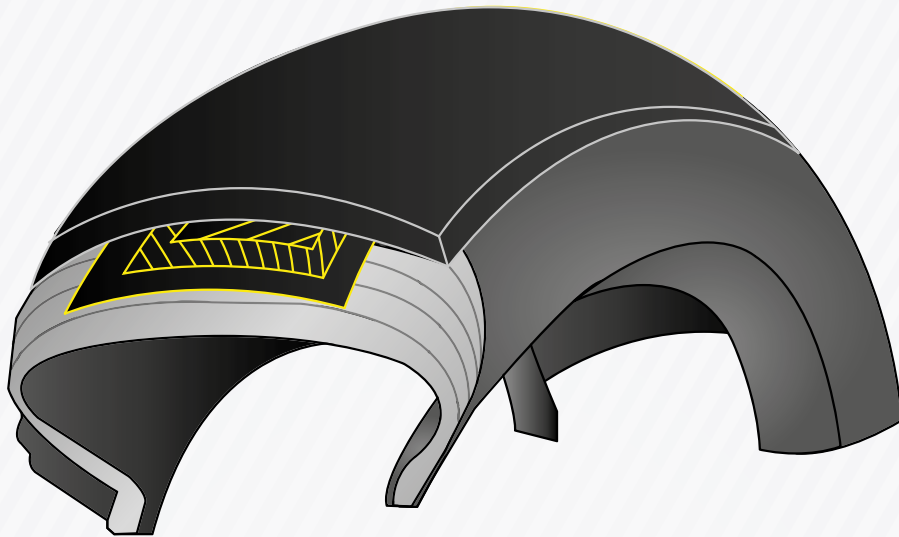
After completing the process of filling the skives, a layer of MB/AC cushion gum should be applied, at a size larger than the rubberized nylon ply (at least 10 mm on each side).



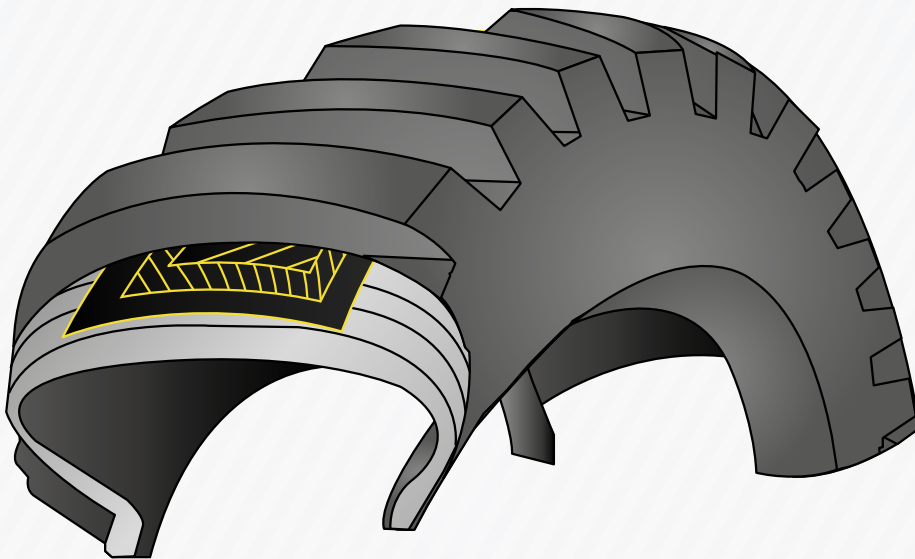
Apply the first ply layer around the full tyre/tire circumference.



Apply the second ply layer at a smaller size than the first (50 mm), and apply in the opposite direction from the first, to follow the casing build type.



Roll the tyre/tire from the hump toward the sides, eliminating all occluded air.



#### EQUIPMENT:

- Extruder.

#### TOOLS:

- Hot knife set;
- Rollers.

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**OBJETIVE:**

Cover the tyre/tire with the new tread.

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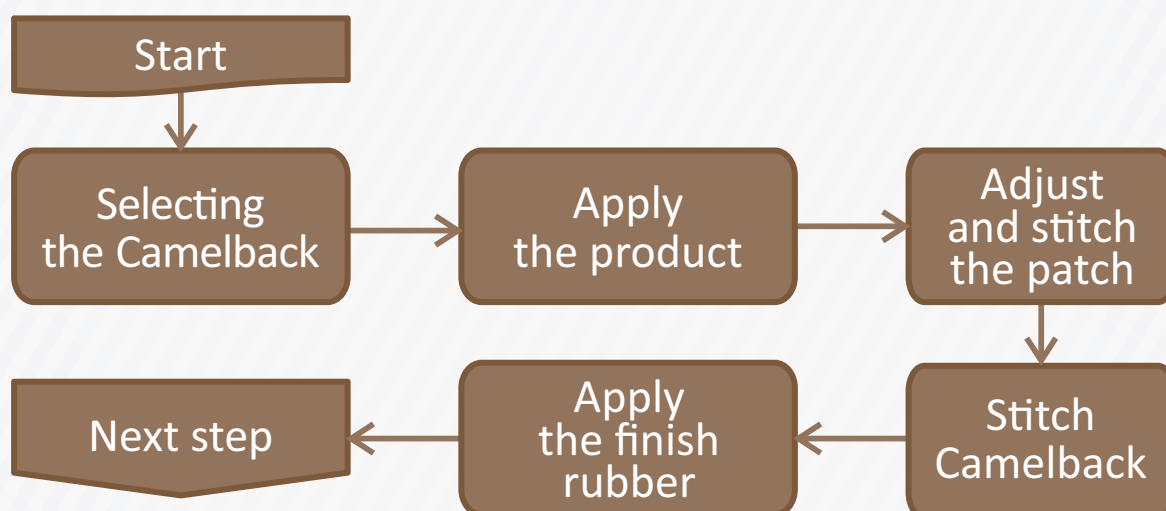
**SECTOR:**

Well-lit and free of impurities.

---

## CVBR Camelback application

### CVBR CAMELBACK APPLICATION FLOWCHART







**PROCEDURE:**

Identify the Camelback according to the service order.

A piece may need to be cut or just cleaned with Vipal solvent/bufpal and steel brush.



Position the tyre/tire in the machine and inflate it to 15 to 20 psi. Remove the piece of plastic from the Camelback, avoiding contact with the cushion. Center it and fix one of the tips on the tyre/tire.





Carefully continue applying the Camelback, partially removing the plastic and ensuring that it is well centered on the tyre/tire.



For perfect adhesion of the Camelback patch, its length should be 10 to 15 mm longer than the tyre's/tire's perimeter. With the aid of a metal ruler, position the ends, hit it with a rubber hammer to increase the patch pressure, and fix it with a proper instrument.





Activate the pneumatic tread pans on the rolling machine so that they work from the hump to the edges, eliminating air from beneath the Camelback.



If lateral finishing is required, spread a thin layer of cement and apply tread gum or remold to the sides.



Measure the perimeter to check the measurements.

---

**Observation:**

Vipal Rubber doesn't recommend the use of rubber shims. The retreader is solely responsible for this practice.

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---

**EQUIPMENT:**

- Builder;
  - Mat or support for the product.
- 

---

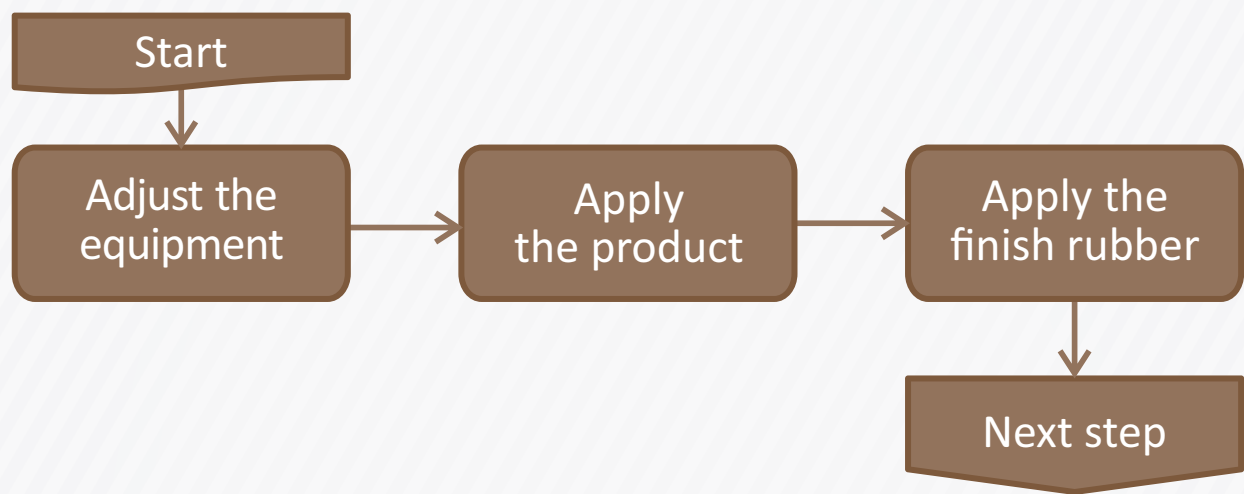
**TOOLS:**

- |                   |                  |
|-------------------|------------------|
| • Rubber hammer;  | • Hot knife set; |
| • Measuring tape; | • Steel brush.   |
| • Metallic ruler; |                  |
-



## Camelback application in Orbitira rubber compound strips

### APPLICATION FLOWCHART FOR CAMELBACK IN ORBITIRA STRIPS

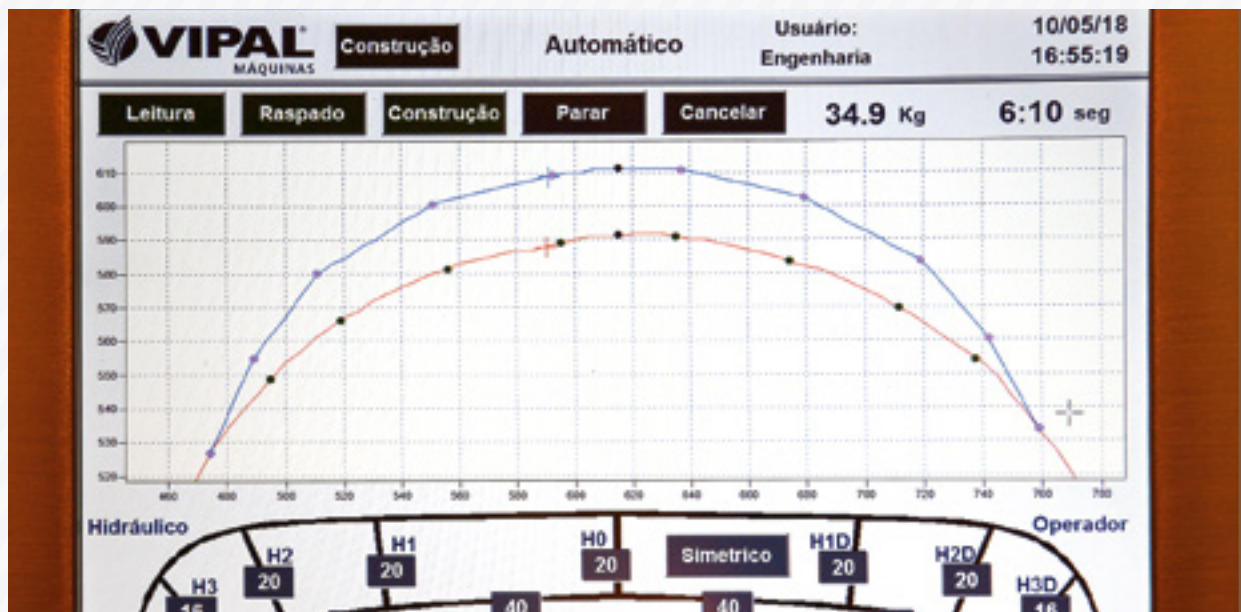


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#### PROCEDURE:

Position the tyre/tire on the equipment and inflate it to a pressure of 15 to 20 psi.

---



Adjust the equipment according to the tyre's/tire's measurement and begin application.

Keep the product's temperature between 75°C and 110°C.



#### Observation 1:

It is important to weigh the casing before and after covering so that the amount of material used can be identified.



---

**Observation 2:**

In the event of interruptions longer than 20 minutes\*, remove the product from the extruder, thus avoiding the pre-cured material application.

\*It is necessary to keep the refrigeration system in operation.

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**Observation 3:**

For a better curing process (reduction of defects by molding, reduction of pre-curing risks, etc.) it is recommended to cure the tire soon after applying the strip.

In a case of use different from the described conditions, consult Vipal Rubber's Technical Team for guidance.

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**EQUIPMENT:**

- Orbitread.
- 

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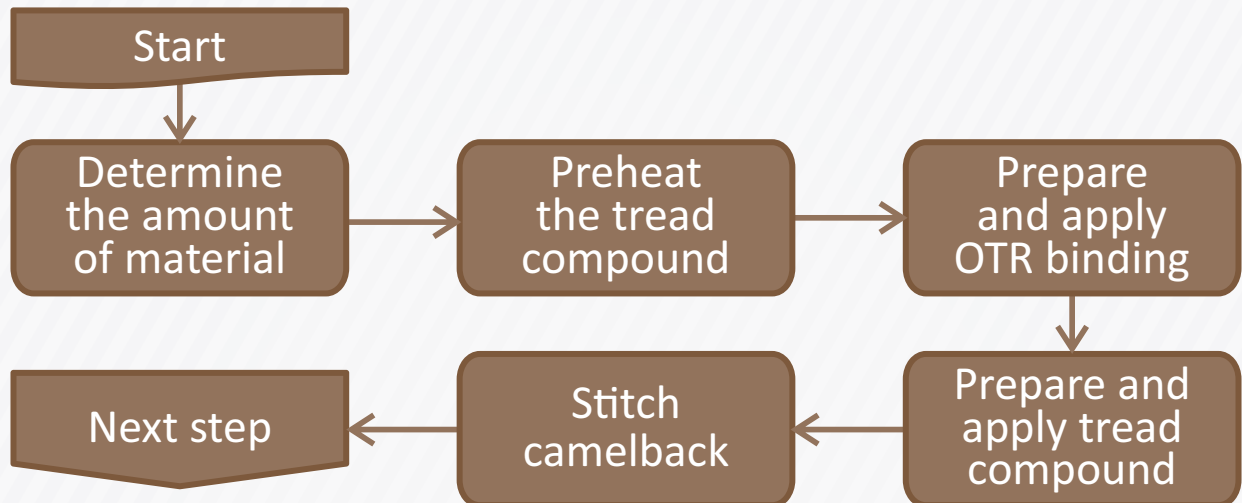
**TOOLS:**

- Measuring tape;
  - Pyrometer.
-



## Camelback application in rolls

### APPLICATION FLOWCHART FOR CAMELBACK IN ROLLS



#### PROCEDURE:

Determine the circumference of the scraped and covered tyres/tires, considering the base or rubber foot. (Sizes in mm).



---

Calculate how many pounds of compound will be needed to cover the tyre/tire, weigh the rubber while maintaining a margin of 15% to 20% more.

---

## COVERED TYRE/TIRE PERIMETER

$$PPC = \left[ \phi IM - \left( \frac{PD}{2} \right) \right] * \pi$$

Where:  $PPC$  = Covered Tyre/Tire Perimeter  
 $\phi IM$  = Matrix Internal Diameter  
 $PD$  = Design Depth

## THICKNESS

$$E = PD * FS$$

Where:  $E$  = Thickness  
 $PD$  = Design Depth  
 $FS$  = Safety Factor 1.05 (5% of safety)

## SCRAPED TYRE/TIRE PERIMETER

$$PPR = PPC - (E * 2 * \pi)$$

Where: *PPR* = Scraped Tyre/Tire Perimeter  
*PPC* = Covered Tyre/Tire Perimeter  
*E* = Thickness

## ROLL WEIGHT

$$Peso = PPC * E * L * D * FS$$

Where: *PPC* = Covered Tyre/Tire Perimeter  
*E* = Thickness  
*L* = Mass Width  
*D* = Compound Density  
*FS* = Safety Factor



Cut the compound into pieces to feed the cylinder.



With the cylinder adjusted and cooled, add the compound ensuring that the mass bank does not exceed 20 cm (approximately) or the bearing limit line.

---

**Observation 1:**

It is suggested that a limit line be identified on the cylinder bearings for standardizing the work.

---



Start the compound homogenization passing it through the cylinder, performing 5 (five) to 6 (six) cuts. Warm-up time is approximately 5 to 10 minutes.

---

**Observation 2:**

In colder seasons, it may be necessary to increase the number of cuts, this will be done within each retreader's conditions.

---



---

During compound homogenization, keep the temperature in the range of 80°C to 85°C. If the temperature increases during the process, check the cylinder cooling, water volume, or even a deficiency in the heat exchange (lack of water).

---

---

**Observation 3:**

As the cylinder is used, crusts can form in the cooling system, being necessary to schedule a preventive cleaning maintenance.

---



After compound homogenization, remove coils of 15 to 20 kg and store them on pallets so that there is a space between the rollers, facilitating ventilation.



After preheating the tread compound, apply the OTR binding, using the same procedure as the tread compound, which can be applied directly to the tyre/tire or saved in spools.



Continue to prepare the rubber to coat the tyres/tires by heating the compound by passing it back through the cylinder and withdrawing the thickness from 7 mm to 10 mm, storing them on a mat or spool.





Immediately apply the amount of compost needed for the tyre/tire.

The layers are according to the size of each tyre/tire and design height, as defined at the beginning of the process.

---

#### **Observation 4:**

When heating the compound to cover the tyres/tires, the procedure must be continuous in the cylinder, with one coil passing after the other to avoid failure.

---



With the tyre/tire covered, set and demarcate the tyre/tire tread width.



Proceed with rolling starting from the hump to the shoulders, descending through all scraped area. The rolling can be done blanket by blanket if it is removed by mat or once by spool. This procedure will be done according to the customer's conditions.



---

**Observation 5:**

In both rolling systems there may be a need for measurement adjustments so that the tyre/tire is in the correct size.

---



After rolling it, remove excess material.



Tyre/Tire with autoclave vulcanization design: After covering, mark the chosen design through a template.



Place the tyre/tire in a trench or filleting stand. Proceed with the design filleting according to the chosen model, depth, and base.

#### Observation 6:

The base for autoclaved retreaded tyres/tires is around 10 mm to 15 mm.



Generally, after filleting, there may be some cracks between the rubber layers, which must be sealed with bonding and glue.



---

**Observation 7:**

- Failure to close these cracks before the tyre/tire is vulcanized may cause air and steam infiltration, causing bubbles leading to roll separation.
  - Filleting rubber leftovers should not be reused on tyres/tires working in medium to high severity services.
  - Do not use MB/AC connecting rubber on tyres/tires covered with rubber that has been passed through the cylinder, as this will cause pre-vulcanization of the connection and subsequent complete release of the roll.
  - Compounds with higher hardness tend to raise the temperature more than normal due to cylinder friction, so greater care needs to be taken.
  - More accelerated compounds also require greater care due to the risk of pre-vulcanization. It is suggested that the working time and temperature be reduced.
- 

---

**EQUIPMENT:**

- |             |                                   |
|-------------|-----------------------------------|
| • Cylinder; | • Mat or support for the product; |
| • Builder;  | • Curler.                         |
- 

---

**TOOLS:**

- |                   |                  |
|-------------------|------------------|
| • Rubber hammer;  | • Hot knife set; |
| • Measuring tape; | • Templates;     |
| • Chalk;          | • Pyrometer.     |
-

# HOT CURING

## OBJECTIVE:

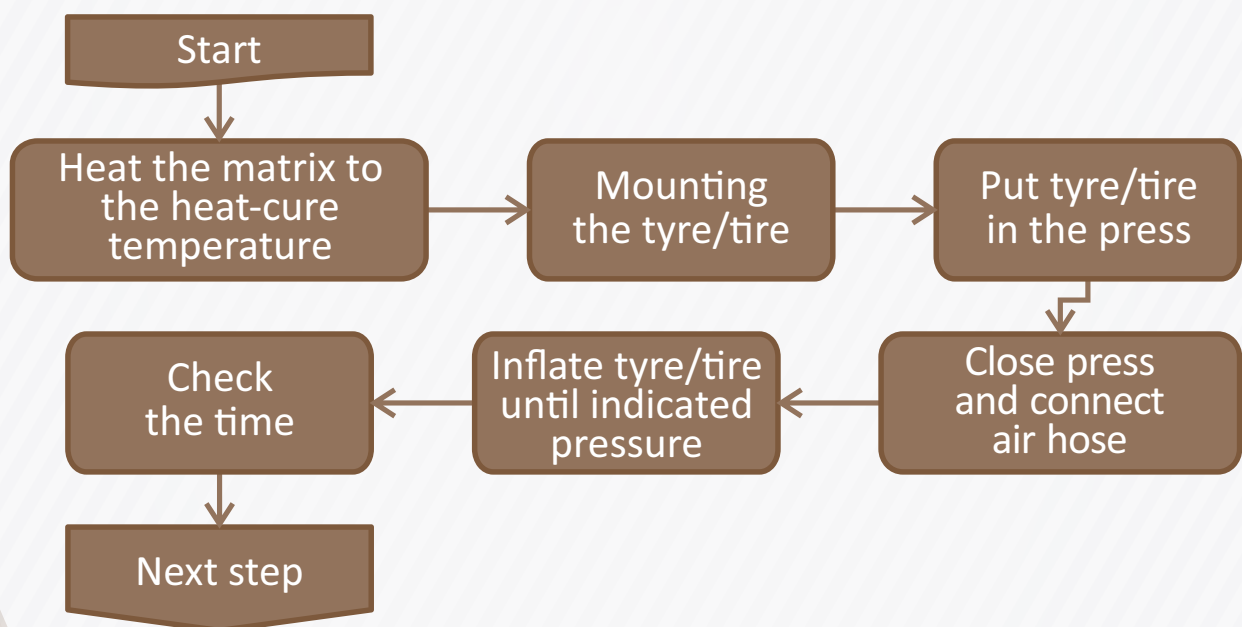
This stage has the function of changing the physical properties of the rubber from a plastic state to an elastic state, by means of time, temperature and pressure, so that the rubber properly adheres to the tyre/tire.

## SECTOR:

Ideally wide to allow handling of the mounted tyres/tires.

## Press Curing

### VULCANIZATION IN PRESS FLOWCHART







#### PROCEDURE:

The press must be correctly assembled with the mould corresponding to the tyre/ tire (no space between sectors) and prepared (heated) using a temperature of 150°C +/- 2°C. During this process it is important for the equipment to remain fully closed, preventing loss of heat.



Assemble the tyre/tire with air bag, protector and wheel.  
Before placing the tyre/tire in the matrix, spread a demolding agent if necessary.



Place the tyre/tire centered in the machine, without leaving gaps between sectors, in order to prevent staggered formation.



Connect the air hose and inflate it to 130 to 150 psi.

---

#### **Observation 1:**

For high ply rating tyres/tires (28 plies or above) we recommend 160 psi, important to check equipment conditions and manufacturer's guidelines.

---





Keep it in machine for the indicated time.

---

### Observation 2:

In order to determine the vulcanization period, it is necessary to know the real evolution in temperature, at the most critical point of heating through a calibrated pyrometer and calculate the vulcanization percentage. Vipal has a specific software for this calculation – contact a Vipal technician. Vulcanization time must be determined according to the type of camelback and its thickness

---

### EQUIPMENT:

- Presses.

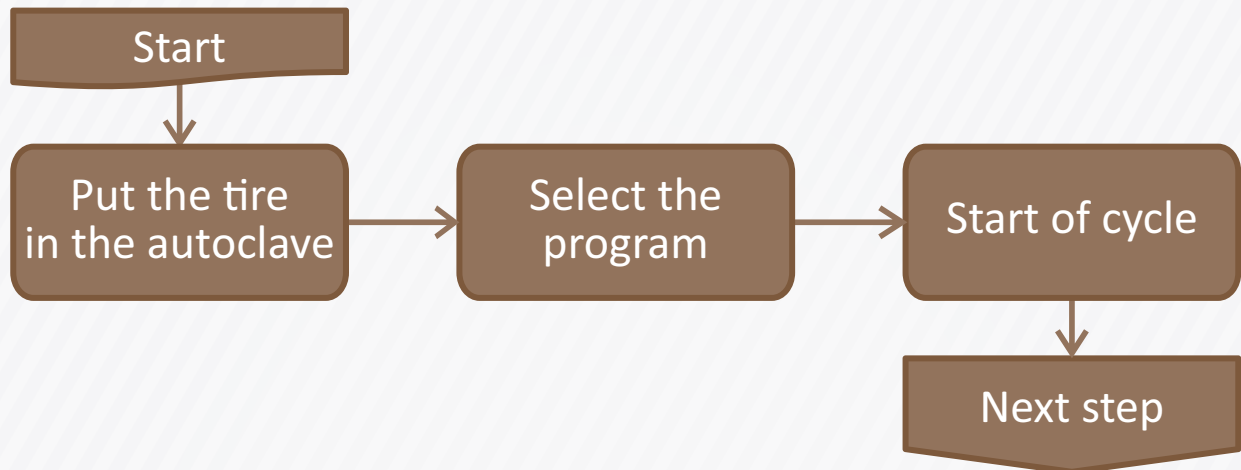
---

### TOOLS:

- Pneumatic jack.

## Vulcanization in Autoclave

### VULCANIZATION FLOWCHART IN AUTOCLAVE (DIRECT VAPOR)



#### PROCEDURE:

According to the tyre/tire and the amount of material applied, adjust the time, temperature, and pressure. Consult the Vipal Rubber technical team.

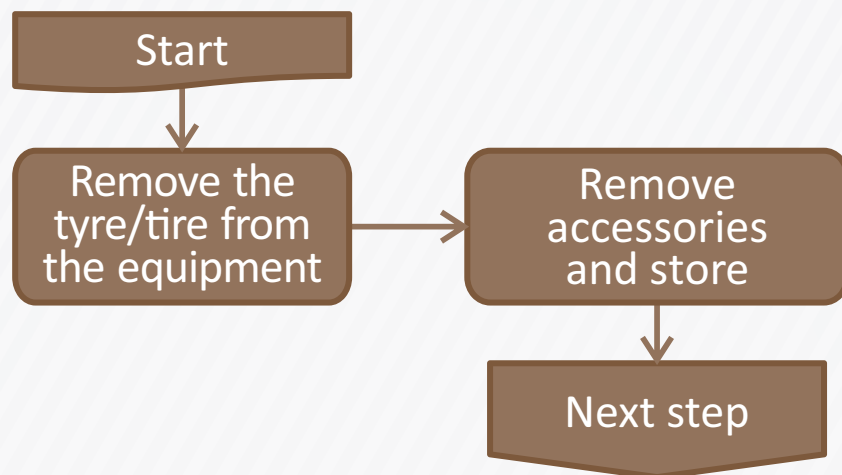
#### EQUIPMENT:

- Autoclave.



# DISMANTLING THE TYRE/TIRE

## TYRE/TIRE DISMANTLING FLOWCHART



---

### OBJECTIVE:

Dismounting the tyre/tire after vulcanization.

---

---

### SECTOR:

This should ideally be extensive to allow for classifying and storing accessories such as wheels, flaps, air bags and envelopes.

---



**PROCEDURE:**

Remove the tyre/tire from the equipment with the aid of the proper tools.



In an appropriate location, remove both parts of the wheel and store them.



Remove and store the accessories (air bag, and flap).

---

**Observation:**

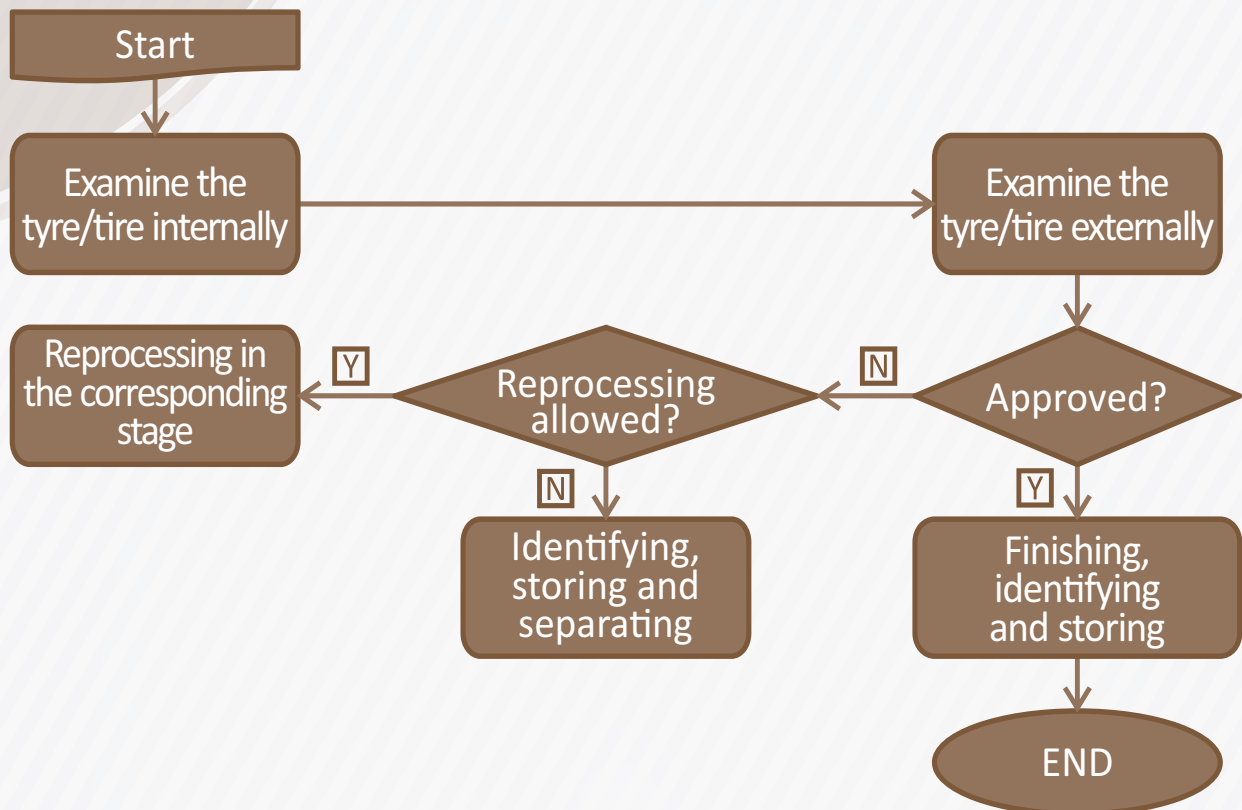
We recommend leaving the air bag, and flap to rest between cycles.

---



# FINAL INSPECTION

## FINAL INSPECTION FLOWCHART



---

### OBJECTIVE:

To ensure that retreaded tyre/tire is in accordance with the critical analysis of the order and of the quality and finishing standards.

---

---

### SECTOR:

Ideally wide, well-lit and allowing classifying the finished tyres/tires by seller, client, or date.

---

---

**PROCEDURE:**

Examine the inside of the tyre/tire, ensuring that there are no internal separations, patches with bubbles or loose liner.

---



Externally, check for dislocations, failures in vulcanization and finishing.

---

**Observation:**

In the event of a defect in the service performed, reprocess the tyre/tire if possible. If not, buff it, put it in the non-compliant area, identify the problem and inform the customer via technical report.

---



Keep the tyre/tire in the horizontal position for cooling.



Eliminate flashes.





With the aid of a polisher, remove excess rubber on the tyre's/tire's sidewall.



Paint the tyre/tire.



Identify the tyre/tire and store it in the area intended for finished products.

---

**EQUIPMENT:**

- Examining machine with lighting.
- 

---

**TOOLS:**

- Polisher.
-

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. In the bottom right corner, there is a faint, light blue circular graphic that appears to be part of a larger design or watermark. The overall appearance is that of a clean, unused piece of stationery.



Blank lined area for writing notes.

## **Vipal Borrachas**

### **Central de Atendimento Vipal Borrachas**

Av. Severo Dulus, 1395 | 8º andar

Bairro São João | Porto Alegre / RS | CEP 90200-310

Tel.: Para Capitais: 3004-0505 - Demais Localidades: 0800 707-0505

[www.vipal.com.br](http://www.vipal.com.br) | [vipal@vipal.com.br](mailto:vipal@vipal.com.br)

**Regional Nordeste:** [regionalnordeste@vipal.com.br](mailto:regionalnordeste@vipal.com.br)

**Regional Norte:** [regionalnorte@vipal.com.br](mailto:regionalnorte@vipal.com.br)

**Regional Centro-Oeste:** [regionalcentrooeste@vipal.com.br](mailto:regionalcentrooeste@vipal.com.br)

**Regional Sul:** [regionalsul@vipal.com.br](mailto:regionalsul@vipal.com.br)

**Regional Sudeste:** [regionalsudeste@vipal.com.br](mailto:regionalsudeste@vipal.com.br)

### **Departamento de Negócios Internacionais**

Tel.: +55 51 3205.3050 | Fax: +55 51 3205.3051

[www.vipal.com](http://www.vipal.com) | [sales@vipal.com](mailto:sales@vipal.com)