

# Effect of Canopus 100 processing oil on the blooming effect of solid tyres

N.N.H.A.R. Lathika, S.M.I.P.G Bandara, G. Chandrasena  
*Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka*

and

H.D.G Sumudumalie  
*Samson Rubber Products (Pvt) Ltd, Galle, Sri Lanka*

## Introduction

Solid tyres are popular in the industrial world. These types of tires are primarily used for industrial or light commercial applications such as light industrial and personal use vehicles (Blanc *et al.*, 1988).

Samson Rubber Products (Pvt) Ltd produces industrial solid tyres by using two rubber compounds namely ST 1125 compound and ST 9048 compound. ST 1125 compound is used to make the inner part of the tyre. ST 9048 compound is used to make the outer part of the tyre. Because, ST 9048 compound is more expensive than ST 1125 compound.

To obtain a good quality tyre, the rubber compound must be calendared on the day itself. Calendaring is done to have a compound sheet of uniform thickness for easy maintenance of the shape of the solid tyre. But, certain time period is needed to calendar the compounds. Sheets cannot be kept more than 24 hours after calendaring. Because some yellowish marks may appear on the surface of the solid tyres after manufacturing which is known as 'blooming effect'. It highly affects on the final quality of the solid tyre.

If the blooming effect can be overcome, the calendared sheets can be kept for certain period until solid tyre manufacturing process is started without affecting the quality of the solid tyre. As a result, the solid tyre manufacturing can be undertaken in a continuous manner. Generally, blooming effect is occurred during vulcanization after two days of calendaring the compounds. During this period, it will move to the outer surface.

Previous research projects carried out on this topic were found that sulphur is not a root cause of the blooming effect. This yellow blooming may occur due to the ingredients contained in ST 9048 compound. Generally, processing oil is added to improve the processability of the compound. In solid tyre manufacturing, the processing oil called 'Canopus 100' is used which is one of the highly refined paraffinic mineral oils. This research is an attempt to determine the effect of Canopus 100 processing oil which is one of the ingredients contained in the ST 9048 compound on the blooming effect of solid tyres.

## Methodology

Seven ST 9048 compound samples were prepared in various phr (Parts Per Hundred Rubber) level of the Canopus 100. The phr level of the oil was varied in a range of 0 phr to 3 phr (0 phr, 0.5 phr, 1.0 phr, 1.5 phr, 2.0 phr, 2.5 phr, 3.0 phr). Each treatment was tested in five replicates. Completely randomized design was used as the experimental design. Response variable was the area affected due to the blooming effect.

Then, compounds were calendared using the calendar machine to make the compounds as sheets for easy maintenance and production. The required amount of the compounds were weighed using the balance. The weight of the 1125 compound sample was 4.9kg and the weight of the

9048 compound sample was 2.3 kg. Those compounds were kept for two days before starting the production. ST 1125 compound (4.9 kg) was wrapped around the rim. Then, the ST 9048 compound ( 2.3 kg) was wrapped on the wrapped ST 1125 compound. The prepared solid tyre structure was inserted in to the press machine at a temperature of 130 C for 85 min. A transparent grid paper was kept on the surface of the solid tyre. Then, the affected area was determined by counting the number of grids.

Minitab was used to analyze the data. The method of data analysis was one way analysis of variance (ANOVA). Mean comparison was done using Tukey test at 95% confidence interval.

## Results and Discussion

According to the statistical analysis, the results obtained in this research can be described as follows. According to the Table 1, there was a significant difference ( $p \leq 0.05$ ) among the treatments. There was a significant difference among the area affected due to blooming effect in treatment 4,3,6,1, and 7. But, there was no significant difference in treatment 5 and 2 in terms of the area affected in due to blooming effect in solid tyres.

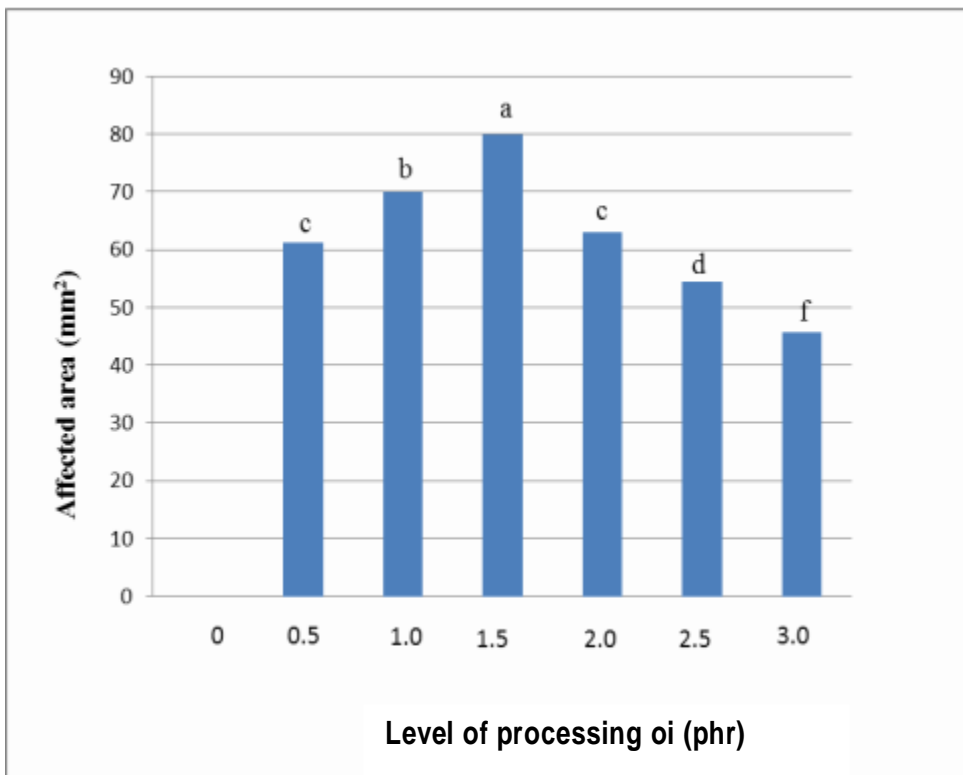


Figure 01: Affected area by blooming depending on the level of processing oil.

\*Means denoted in same letter are not significantly different at the 5 % level of significance.

If the affected area is high, the blooming effect is also high and vice versa. Considering the results, the level of processing oil which contributes for the maximum affected area due to blooming effect is not suitable. Because, the quality of the solid tyre reduces when increasing the area affected due to blooming effect. The level of processing oil which recorded the least bloomed area in solid tyres can be identified as the best treatment.

According to Figure 1, specific pattern was clearly identified between the level of processing oil and the area affected due to blooming. When the phr level of processing oil was increased, the area affected due to blooming effect was significantly increased. Maximum affected area was observed in the treatment 4 in which the level of processing oil was 1.5 phr. Because, silica bonds are highly activated at the 1.5 phr level of processing oil. Therefore, those silica bonds are made cross links with the processing oil at that range of processing oil. Therefore, the blooming effect can be seen on the surface of the solid tyres (Subramaniam and Encyclo, 1988). When the phr level of processing oil was increased further, the affected area due to blooming was significantly decreased.

The least affected area due to blooming effect was observed in the treatment 7 in which the level of processing oil was 3 phr. Therefore, processing oil with a phr level of 3 was the best treatment out of the seven different levels of Canopus 100 processing oil tested. Also, that is the currently using concentration of processing oil in the solid tyre industry. Because, it is the optimum phr value of processing oil used in solid tyre industry to improve the properties of the compound.

The processing oil used at the level of 3 phr improves the processability of rubbers and rubber compounds while increasing the bulk of rubber to reduce the cost of oil-extended rubbers. According to *Subramaniam* (2012), following specific requirements namely low viscosity and elasticity, less power consumption and aid dispersion of fillers are shown at the low dosage of 3 phr. In addition to those, the following additional requirements are also met at the level of 3 phr of processing oil such as not affecting the intended properties of finished products and acting at low dosage level.

## Conclusions

The results of the research revealed that there is an effect of Canopus 100 processing oil on blooming effect of solid tyres. Three phr level of processing oil is the best among the different levels of Canopus 100 processing oil tested. And also three phr level of processing oil is the optimum value to incorporate with ST 9048 compound to obtain a high quality solid tyre

## References

- Blanc, J. L., Lloyd, D.G. (1988). Rubber world. William publication.
- Subramaniam, A., Encyclo, E. (1988). Polymer science. England publication.
- Subramaniam, K. (2012). Basic chemistry and technology of polymers. Sarasavi publications.