Formula Vee Association of Australia
Tyre Tender 2019

Information Pack for Members

Compiled by Greg Hepburn and Rod Lisson

Date: 3/5/2019

Contents

Introduction

In 2018 it was decided by the FVAA board of management (BOM) that FVAA would initiate a Tender process to select a control tyre to be used by FVAA members from the beginning of 2020. It was decided that the process would be as follows –

1. Obtain expressions of interest from Tyre Vendors
2. Obtain Quotes from interested Vendors
3. Perform Technical Testing at various different tracks/surfaces (Determined at BOM)
4. There were originally 3 planned tyre tests. At the request of Tasmania during a BOM meeting Baskerville was added as a 4th test to ensure adequate numbers of 1200s were tested.
5. Compile results into a complete, unbiased information pack (This document)
6. Distribute the document to all FVAA members and get each state to perform an internal vote. (Method to be determined by each state's committee)
7. BOM Members then return a single vote for their state.
8. Tyre vendors are notified of the result and the new or existing tyre to be used from the start of 2020. There will be a 12 month sunset clause on the current tyre if a faster tyre is selected. If a slower tyre is selected there will be no sunset clause.

FVAA would like to sincerely thank all tyre vendors for participating in this process and appreciate the fact they have given us 4 excellent options to choose from. FVAA would also like to thank those volunteers involved in the testing and tender process - it has been a lot of work. In particular, the BoM would like to thank the NTC Chairman Greg Hepburn for his hard work and the exceptional amount of his own time he has devoted to the process.

In reading this document we ask you to understand that –

1. Drivers have been asked to provide feedback on how the tyres felt on the track and nothing more. Their opinions do not reflect cost, durability, stresses on car, ride heights or any other factors. Purely "How did it feel and perform on the track?".
2. The National Technical Committee have been asked to analyse the technical facts and observed characteristics of the tyres. This also includes possible issues with ride heights, weights, stresses and breakages due to any of these. They were also asked to optionally provide their individual opinion based on this review.
3. The BOM has conducted the pricing review based on information supplied in the tenders.
4. The BOM has been asked to review the process and ensure relevant information is present.
5. The decision is in your hands. Your BOM representative should cast your state's vote according to your states wishes.
6. We have tried to remove all emotion and agendas from this process and just present the information that is relevant for you to make your decision.

Drivers Opinions

Tyre Preference by Score

Each driver was asked to rate the tyres based on their driving experience on the test day. No other factors were allowed here except how it felt to drive. They rated tyres from 1 to 4 in order of best to worst experience. Those numbers from each driver for each tyre were then added together to present a single list. They were then assigned 1 to 4 based on the total score. Best experience = 1. Worst = 4.

The following table sets out those numbers for each track.

	SMSP	Qld Raceway	Baskerville	Barbagallo
Hoosier	2	1	2	3
Dunlop Race	1	2	1	1
Dunlop Radial	3	4	3	2
Yokohama	4	3	4	4

The total rating for all opinions in order or most preferred to least on total score (Lowest=best) and rating as first choice (Remember this is driving only, no other factors considered) was

1. Dunlop Race Tyre (Score 20. First Choice 87%)
2. Hoosier (Score 37. First Choice 13%)
3. Dunlop Radial (Score 44. First Choice 0%)
4. Yokohama (Score 59. First Choice 0%)

When adding total scores the closest margin was between Hoosier and Dunlop radial for 2nd or 3rd place.

This driver opinion score indicates a clear preference for one tyre based solely on drivability. This comes as no surprise as race tyres are specifically designed for that purpose and should outperform radial tyres in this aspect. It should not be your only basis for selection as no consideration is given to pricing or other technical factors. Please continue reading for further information.

Driver Comments

The following driver comments relate to how the tyre felt on the track only. Drivers all tested the tyres in a different order so may have had slightly different experiences going from high grip to low grip etc. We have included their names here as you may have specific drivers from who you most want to see opinions. Please do not use this information to disparage any driver as they have all given their time freely to assist with this process. The opinions represent a cross section of classes, states and positions. Test Drivers note – some parts of comments have been removed if they fell outside of the guidelines “What did it feel like on the day”.

Hoosier

Jeff Cadman – I was disappointed by the Hoosier, not as good as I remember it from before. A definite last for me!

Myles Lockett - Massive vibration though car when I was on track, thought it may have been a balance issue of the tyre and rim or the car but was the same for all drivers who tested them.

Franz Esterbauer - Some vibration when the tyres were cold. Very light steering. Easy to control oversteer without losing momentum. Less steering lock required compared to the Yokohama.

Rod Lisson - This tyre felt a little unstable in the rear under braking. It also felt unpredictable when breaking away through corners.

Dave Caisley - Hoosier: grip was good but when pushed they broke away unexpectedly. Also suffered from tyre shake until warmed up.

Brett Scarey - The tyres performed well. A little vibration in the handling on my car and had some slide but it was a controllable side. The tyre seemed very consistent over the 7 laps with best times of 1.12's

Austin Pearson – Grips well but tyre shakes and isn't stable.

Noel Clark - The car felt predictable and stable on the warm up lap which was at reasonable speed. Steering wheel feedback through corners, over bumps and heavy braking was minimal and not concerning at all. The tyre was stable at all speeds, was consistent over the total laps and when I was untidy (causing oversteer in high speed turns) I was able to correct it with little concern. The tyre allowed me to "commit" without fear of losing control totally. Braking feel was good with no to minimal wheel shudder. I believe there was little difference between this tyre and the Dunlop Cross ply in "feel" and overall speed. My car is fitted with conventional "H" beam, oil shocks and leaf spring at the rear.

Wade McLean - The vee just felt alive, you could feel every movement the vee made. These were just as good as the Dunlop Race tyre apart from I felt I could make more adjustments to improve the vee on the Dunlop.

James Curran - A very close second to the Dunlop. I would be equally happy racing on this tyre. Very predictable with good feel. Good under brakes and at turn in and exist.

Dion Wylie - This was the best overall grip tyre, also came up to speed in 2 laps. Good feeling through steering wheel.

Craig Sparke - *Was a fresh set on first heat cycle, I would expect improvement on future heat cycles. Nimble, light, the car felt alive. Good mid corner grip, great grip pulling out of corners where you could just punch the throttle and go. Not the best under brakes, but could be because of first heat cycle. Fun and challenging to drive.

Dylan Thomas - The Hoosier is still a very good race tyre and I would welcome them with open arms should they be voted in

Brady Nicholls - Had not driven on this tyre before, was as expected from a racing tyre and enjoyable to use.

Curtis Porter - Car Felt Light, turn in was good tyre was very predictable. Car was stable under brakes and was able to brake later then current tyre. Was fastest tyre of the test.

Dunlop Racing

Jeff Cadman – Hard to fault in any aspect. Just brilliant. (In a class of its own). Cannot be beat.

Myles Lockett - Best tyre of the day, easy to get up to temp, stable under braking, cornering and acceleration, gave great confidence in the car to be able to push.

Franz Esterbauer - Confidence inspiring. I just kept throwing it into the corner harder and harder and it just stuck. Initial slight turn in oversteer with current setup that could be tuned out. Some minor mid corner vibration through the wheel. Easy to control oversteer without losing momentum.

Rod Lisson - This tyre felt good at all levels. On the most used set it did seem to take several laps before it heated up and turned on. Could be that my car is setup for radials. It was still clearly fastest for me.

Dave Caisley - Dunlop cross ply: grip was far superior, fairly predictable, comfortable when cold

Brett Scarey - My favourite tyre. The Tyres came on straight away and performed well. Felt good and felt like the car was on rails. I did my best lap on this tyre with constant low 1.11's.

Austin Pearson – Best all round tyre for grip and stability

Noel Clark - The car felt predictable and stable on the warm up lap which was at reasonable speed. Steering wheel feedback through corners, over bumps and heavy braking was minimal and not concerning at all. The tyre was stable at all speeds, was consistent over the total laps and when I was untidy (causing oversteer in high speed turns) I was able to correct it with little concern. The tyre allowed me to "commit" without fear of losing control totally. Braking feel was good with no to minimal wheel shudder. My car is fitted with conventional "H" beam, oil shocks and leaf spring at the rear.

Wade McLean - The vee came alive on these tyres, I was able to push the vee to its limits and have more performance still left in the tyres. These along with the Hoosiers were very close in my opinion.

James Curran - This tyre was very predictable and felt good under braking and through the corner (entry to exit). Light steering load, and good feel. Much the same as the original Dunlop.

Dion Wylie - Took about 4 laps to have good grip, Quite a lot of understeer in early laps. Felt unstable at high speed (maybe wind had picked up).

Aaron Lee - Big eye opener. Car was far more forgiving than I have experienced. Was easier to correct a slide, Tyres held on when I really thought I over stepped the mark. Could brake later and more confident.

Really smooth,

Nothing negative to say. Excellent fun I wish I could have driven for longer on them.

Craig Sparke - FUN+!! I had more fun on these tyres in two sessions by myself than I did in the whole last year of racing. Awesome mid corner grip, you could throw the car in so hard and it would just whip you around the corner. Every lap I just threw it at corners harder and harder and it just kept on gripping. They challenge you as a driver to improve your driving. These little cars are so awesome and unique on a tyre like this, I couldn't get the smile off my face for the rest of the day after driving on these.

Dylan Thomas - This was the fastest tyre with the best grip and feel so as a driver was easily the most enjoyable to drive on.

Brady Nicholls - Enjoyed driving on tyre and was predictable throughout test

Curtis Porter - Could brake late but would jump hard under brakes, due to wheel balance issue tyre was undrivable which shook exhaust off car.

Dunlop Radial

Jeff Cadman – Noticeably less grip even when warmed up. Any slides were predictable/controllable in the main.

Myles Lockett - During my run I had shudder under brakes for the first few laps but then as the tyres heated up seemed to go away slightly, apart from this good confidence in cornering ability, felt better in cornering than the Yokohamas.

Franz Esterbauer – Better overall grip than the Yokohama. Able to control oversteer without losing momentum. Seemed to be a fast vibration/resonance under hard braking.

Rod Lisson - I really liked this tyre. It was 2nd slowest for me but felt awesome even from the first corner. When sliding through the lefthander it felt predictable and didn't seem to wash off speed the way the Yokohama does.

Dave Caisley - Dunlop radial: felt heavy through the wheel, very comfortable in a slide.

Brett Scarey - These tyres handled very similar to the Yokohama's but I found that the speed of these tyre where quicker than the Yokohama with high 1.12's

Austin Pearson – Not much grip but reliable when sliding through corners.

Noel Clark - On leaving the pit exit I immediately felt the "heaviness'" of the tyre through the steering wheel. Note: My car is fitted with a steering box. Feedback / shaking through the steering wheel was evident on turning into the top of the esses initially and did not get any better through corners as the tyre temperature / pressure increased. It gave me little confidence through low and in particular high speed corners as the handling characteristics changed continually with little consistency. There was extra movement of the shock absorbers in both bump and rebound generally. I found that I had to "slow down" on corner entry to get the car to turn in and could not drive the car at its maximum which was disappointing. I did find the tyre good under heavy braking as far as grip level but it caused extra wheel shudder over the cross plys. I did not increase the camber but believe that extra camber would not have decreased the "heavy feel" or improved the consistency of the grip level. I did not enjoy driving the car with this tyre fitted.

After driving on the Yokohama radial I believe that this tyre is marginally better in most of the areas that I mentioned above.

Wade McLean - Not a bad tyre, the vee wasn't as predictable on these and didn't feel fantastic to drive on. I felt these tyres limited the performance of my vee.

James Curran - Very similar to the Yokohama. Very heavy through the steering, with entry understeer. Minor shudder under braking, but OK. Not my preferred racing tyre.

Dion Wylie - This tyre came up to speed in 1 lap. Personally I don't like this to happen as it doesn't allow someone to push hard on cold tyres & gain an advantage.

Aaron Lee - This tyre still have the braking and hard lateral load oscillation. Was faster than the Yokohama on the old set. The new set didn't feel anywhere near as good. Was also 1sec slower. These tyres struggled with lateral load and skated across the surface a 4 wheel drift.

Craig Sparke - Marginally better than Yokohamas. Only major difference to a Yokohama were slides were a bit more progressive. Running back to back compared to a racing tyre felt like someone had just bolted 300kg on to the back of the car, the car just feels heavy, slow to react to inputs and generally lazy. Braking is acceptable though still not as good as racing tyres. The difference in mid corner grip is MASSIVE when you drive these back to back compared to a racing tyre. They just slide too easily and you end up fighting the car for the rest of the corner. Frustrating to drive on the edge, there's just no reward for pushing the car.

Dylan Thomas - I found the Dunlop radial to be far better than expected on the Vee. I was able to stay with the Jacer with Tim Brook driving it very well during the session and more surprising it was not just from the tow. Through turn 4 and 5 of SMSP with the change of direction the grip was there to hang on to him. I do run them on my Toyota 86 so am comfortable with these tyres already. But the grip, feel and predictability made me very comfortable to push on these tyres.

Brady Nicholls - Very surprising tyre and was impressed with its overall performance. Grip reduced toward back of session but no major complaints

Curtis Porter - Wasn't overly amazed by this tyre. Felt heavy. Found lack of turn in with this tyre. Slowest tyre of the test

Yokohama

Jeff Cadman – A good all-round tyre that we have adapted our driving style and car setup to suit.

Myles Lockett - No issue with the tyre, good grip under brakes, turn in and acceleration, just a heavy tyre.

Franz Esterbauer - Good performance from cold and doesn't seem to lose performance once hot.

Rod Lisson - I have no issues with this tyre except lap times. It was definitely slowest and therefore my least favourite.

Dave Caisley - Yokohama: feel heavy through the wheel, great under brakes, predictable.

Brett Scarey - My least favourite tyre. I used the temps that they recommended but found they were way to high to want I currently use. Best times where low 13's

Austin Pearson – Not much grip overall and breaks away through corners.

Noel Clark - On leaving the pit exit I immediately felt the "heaviness'" of the tyre through the steering wheel. Note: My car is fitted with a steering box. Feedback / shaking through the steering wheel was evident on turning into the top of the esses initially and did not get any better through corners as the tyre temperature increased. It gave me little confidence through low and in particular high speed corners as the handling characteristics

changed continually with little consistency. There was extra movement of the shock absorbers in both bump and rebound generally. I found that I had to “slow down” on corner entry to get the car to turn in and could not drive the car at its maximum which was disappointing. I did find the tyre good under heavy braking as far as grip level but it caused extra wheel shudder over the cross plys. I did not increase the camber but believe that extra camber would not have decreased the “heavy feel” or improved the consistency of the grip level. I did not enjoy driving the car with this tyre fitted.

Wade McLean - Through high speed corners, the rear end would snap out without notice and made it very difficult to feel confident to push the vee hard. I felt these tyres were at their limits and my Vee had more left in it.

James Curran - Tyre was very heavy through the steering. Shudder under heavy braking, and some understeer at corner entry. Not as nice to race on as the Hoosier or Dunlop Racing tyre.

Dion Wylie - Took 3 laps to come up to speed, by lap 7 & on became loose in back of car. Heavy steering compared to other tyres.

Aaron Lee - I had only ever driven on these prior to the test so this was my benchmark. After I ran the Dunlop I ran these and the Mid corner grip was far less. Skating across the surface rather than gripping into the surface. Lots of 4 wheel drifting. Braking and Lateral load saw oscillation through the steering wheel.

Craig Sparke - MASSIVE lack of mid corner grip compared to the racing tyres. Tyres slide too easily, you are unable to push the car to gain an advantage. Car feels 300kg heavier, not nimble, lazy inputs. Braking is average, little feel or feedback for locking.

Dylan Thomas - We are all well used to the Yokahama by now and as a tyre they are fine. The reason that it comes in last for me is that the tyre always takes a few laps for the rear to come on for me. And once they are up the feel under braking is not as good as any of the 3 other tyres tested and lock ups are common. On this basis the confidence to throw it up the inside of someone is not there as I can’t be sure it will pull up or lock up.

Brady Nicholls - Tyre performance is acceptable in isolation but not as enjoyable in comparison to the types for me. Grip reduced toward back of session and could note the braking distance change.

Curtis Porter - Not many issues with the tyre. Car was heavy prepared to the Hoosier. Car was predictable with no surprises. Not the Fastest Tyre but felt confident to push on the tyre.

NTC Information

NTC Recommendations/Opinions

The National Technical Committee is comprised of the technical director (Or equivalent representative) from each state. These are the people we trust to help keep our racing fair, safe, affordable and hopefully future proof. They work hard all year round to help achieve these goals and the BOM sincerely support and appreciate their efforts.

In relation to this tyre testing, not all NTC members have shared the same opinion of outcome. This is a perfectly acceptable outcome from the NTC and we have encouraged them to provide their individual opinion here for your benefit. Some have done so here and others believe it is best for them not to influence the decision of their drivers. Once again, the BOM fully support both of these positions.

The individual opinions provided are as follows -

Chris Reynolds (NSW)

All Based on testing and previous experience, my preference is the Dunlop CR82 cross-ply race tyres (DX). These deliver the best performance, value for money and confidence for close driving - which Formula Vee is renowned for.

As reflected in the tyre testing, and previous seasons when DX was the control tyre, the durability and consistency is better than the Yokohama and Hoosier which results in more cost effective racing for all competitors. The Dunlop responds better to setup changes and adjustment of tyre pressures etc. than the radial which is what the category helps develop in drivers/competitors. The DX also has a larger diameter which results in lower RPM (by 200 to 400 revs) on the straights while giving better punch out of corners. There have been a number of big-end issues in NSW which are likely (at least in part) a result of the higher RPM experienced with the Yokohama radial.

Of safety concern is the use of the heavier and flexing walled radial tyres - namely the Yokohama (I expect the Dunlop Radial will be similar). Since their introduction there have been a number of component failures in NSW not commonly seen in my 14 years of racing with cross-ply tyres. Drivers have reported more feedback through the steering with less 'feel'. Cars aren't responding to setup changes.

Front running competitors have also been changing tyres more frequently - reporting drop-off in performance after 7-8 heat cycles. With a practice day, qualifying and three races - that's every meeting! I believe this has widened the gap between the front runners and the mid field and even further to the tail end. If competitors can't get a decent and consistent lap time (and have fun) on a set of tyres over 4-5 meetings they leave their cars in the shed.

I believe we need to develop the category and move to a race tyre to attract drivers moving to race cars i.e. Go Karters who are going get the correct feel with any small set up change and make the category more appealing

Anthony Lees (WA)

After further evaluation of the technical data it would appear in principle that the Dunlop race tyre is the best option. I know this is only part of the whole issue being based on value etc.

I don't think there is one option that will give us everything ie longevity, cost, performance. Racing does cost money and I feel the tyre is much like putting petrol in the car, it's just part of the cost of going racing.

Bruce Acheson (QLD)

As requested, I would like to comment on the recent tyre testing, with a view to selecting a control tyre for Formula Vee, for the next few years. Although I was not one of the 2019 test drivers, I have driven on three of the four tyres tested, i.e. Dunlop Cross-Ply, Hoosier Cross-Ply and Yokohama Radial. As the other tyre (Dunlop Radial) had little or no support, I think it should be eliminated from the decision, especially given its extra weight. In the tests conducted over four states, the obvious winner was the Dunlop Cross-Ply. (in the opinion of the vast majority of drivers) From past experience, I was surprised that the Hoosier didn't fare better in the comparison. The clear loser was the Yokohama. This did not surprise me at all. My choice would be to go with the majority and select the Dunlop Cross-Ply. In my opinion, the only benefit of the Yokohama is that it is good in wet conditions,

Noel Clark (TAS)

From what I experienced in the tyre test both the Dunlop and Hoosier X plies were without doubt the better of the tyres to drive on. As I hadn't driven a car with the Yokohama I kept an open mind to how they would perform / feel. Instantly (as per my test report) both radials felt heavy and somewhat unresponsive and sometimes unpredictable in general and certainly gave little confidence to push to the limits through high speed turns.

I have no real idea of the costs of each tyre but just assumed that they would all be within a few hundred dollars of each other.

I can't really add much more as I covered it with my initial test report. My first option was the Dunlop cross ply with the Hoosier a close second which I still think is the best way forward as a control tyre for this class.

NTC Technical Report

Introduction

Four tests held at four tracks, the venues were selected in 2018. Tracks were selected on merit of best feedback. The days of hiring a circuit for exclusive use are no longer economically viable so a compromise has been reached of holding the testing at Private Practice days which limits track time. Due to limited track time to enable comparison between tyres, a race meeting will be defined as 4 races of approximately 20 Klm; 80 Klm per meeting. For a total of 4 race meetings; heat cycles would be 4 x 4 = 16.
Reality a competitor would do 120 Klms at a race meeting which is 50% increase over the test distance; this will be taken into consideration when wear is calculated below. Extrapolating results has been done linear; in reality it may be exponential.
The Dunlop Radial is new to F Vee; we have prior knowledge on all the others as they have been used as the Control Tyre at different times. The Dunlop X Ply (CR82) is now manufactured in Portugal.

Evaluation Criteria

1) Initial price- preferred maximum price around $1,000
2) Buffing- Does Tyre respond to buffing? Added cost and limits tyre life.
3) Number of heat cycles before lap time's drop off of 3/4 seconds.
4) **Wear-** will wear be greater than performance drop off
5) Is the tyre bidirectional- allows tyres to be rotated to minimise wear.
6) **Wet performance**- is the tyre predictable and consistent in the wet.
7) **Driver Preference based on performance**. Ensure Driver ability over Horsepower
8) **Fit for purpose**- Will the tyre meet current rules (or will cars need to be modified).
Emphasis should be on actual competitive racing laps / $
No wet test has been done, from previous knowledge and Toyota 86 information all should pass.

Tyres Tested

Make	Type	Front Rear	Size	Pattern	Rim Width	Diameter	Overall Width	Weight
					inch	mm	mm	KG
Yokohama	Radial	F	185/55/15	AD 08	5.5	585	190	7.6
Yokohama	Radial	R	195/55/15	AD 08	6	593	200	8.7
Dunlop	Radial	F	195/50R15	Z3	5.5	577	201	8.6
Dunlop	Radial	R	195/55R15	Z3	6	597	201	9.6
Dunlop	X ply	F	120/590/15	CR82	4.5-6	579	161	4.6
Dunlop	X ply	R	135/620/15	CR82	4.5-6	617	190	6.5
Hoosier	X ply	F	120/590/15	Vintage	4.5-6	574	155	4.5
Hoosier	X ply	R	135/620/15	Vintage	4.5-6	612	175	5.2

Note Both Radials are directional; both X ply tyres are bi directional.

Car set up

Of the 20 cars that participated only 5 cars were set up for cross ply racing tyres, the remainder kept their Yokohama Radial set up. **The extra camber required for a radial reduces the contact patch on the Cross plies and effects both performance and wear**. This needs to be taken into consideration when reading any data. (Cars NC, BN, TB were set up for X Ply; MK & AP adjusted set up).
Normal Camber settings, Radial tyres 2˚ to 3 ˚ X Ply 1˚ to 1 ¾˚.

Test Track Notes

Test 1- Baskerville
Air temp 18 to 21 C˚ Track Temp 35 to 48 C˚
Tasmania put their hand up to do the initial set of heat cycles, this test also allowed 1200 representation feedback as the next two tests were all 1600s.
All tyres were bedded on day before test
Tyre wear and driver feedback were recorded. All cars 1200cc

Test 2- Queensland Raceway
(Originally intended for Morgan Park, change of venue due to availability)
Air temp 29 to 32 C˚ Track Temp 36 to 46 C˚
Bad vibrations were noticed in the Dunlop CR82 runs, these were traced to the rims they were on. One rim was unable to be fully balanced and prevented 2 cars to complete the test. (Note the two cars in question had large amount of axial free play in their rear axles). Future test all rims were balanced.
Tyre wear and driver feedback were recorded. All cars 1600cc.

Test 3-SMSP
Air temp 23 to 32 C˚ Track Temp 30 to 56 C˚
Limited track time available. Heat also kept runs to a minimum in the afternoon and effected lap times. CS and AW bedded set 2 tyres in the morning.
Note- Two cars experience mechanical problems which limited their running, some lap times were taken from rolling lap information rather than actual lap times. CS took over some of the runs in the afternoon. Extra laps were completed on DX1 to make up Test 2 distance.
Performance drop off has been adjusted to correct slow afternoon sessions.
Tyre Wear, driver feedback and performance drop off were recorded. All cars 1600cc.

Test 4- Barbagallo
Air temp 17 to 27 C˚ Track Temp 30 to 43 C˚
New track surface, 2 cars went under track record on Dunlop X ply. Tyre wear was nowhere as great as in the past. Timer malfunctions experienced on a couple of cars.
Four 1600ccc cars performed wear, driver feedback and performance drop off.
Three 1200cc cars gave driver feedback.

Driver Feed Back

Driver feedback averaged over 4 test	YR	DR	DX	HX	order of merit
General					
Dry Track Grip	6.9	7.2	8.6	7.7	DX,HX,DR,YR
Wet Track Grip	_	_	_	_	_
Wheel spin - (Lots - low score, little - high score)	7.2	6.3	7.6	6.9	DX,YR,HX,DR
Consistency - Do they keep the same grip over more than 4 laps?	7.4	6.8	8.6	7.6	DX,HX,YR,DR
Lap One Performance - Long time to get up to temp - low score, quickly up to temp - high score	6.6	7.3	7.9	7.0	DX,DR,HX,YR
Shudder. Is there any steering or general wheel shudder? No - high score, yes - low score (inverse score for merit) *	7.0	7.3	8.0	7.1	DR,HX,YR,DX
Cornering					
Turn in Grip - Does this tyre give good steering response on turn in? Yes - high score, No - low score	6.8	7.6	8.8	8.1	DX,HX,DR,YR
Exit grip - do the tyres maintain grip right to the exit of the corner? Yes - high score, No - low score	6.7	7.2	8.8	7.7	DX,HX,DR,YR
Slide Consistency - Is a slide easy to control on this tyre? Yes - high score, no - low score.	6.9	7.3	9.1	7.9	DX,HX,DR,YR
Balance. - do the tyres give good confident balance in the corner? Yes - high score, No - low score	6.9	7.1	8.9	7.4	DX,HX,DR,YR
Racing - At speed					
Offline Grip. - Good offline grip or bad? Good - high score, bad - low score.	5.5	6.1	6.9	6.2	DX,HX,DR,YR
Grid Start. - Does the tyre give good immediate grip on grid start? Yes - high score, No - low score.	6.9	6.2	7.6	6.7	DX,HX,DR,YR
Warm Up - are the tyres easy to warm up? Yes - high score, No - low score.	7.4	7.2	8.4	7.5	DX,HX,YR,DR
Out braking - are you able to brake later than normal marker? Yes - high score, No - low score	6.4	7.1	8.5	6.8	DX,DR,HX,YR
Direction Change - does the tyre react well to high speed change of direction? Yes - high score, No - low score.	6.3	6.3	8.4	7.3	DX,HX,DR,YR
Would the car benefit from a change in setup? yes - high score, no - low score.	4.9	5.7	6.1	6.5	HX,DX,DR,YR
Braking					
Does the tyre give good brake feel and grip? Yes - high score, No - low score	7.1	7.2	9.1	7.9	DX,HX,DR,YR
Lock Up - Did the tyre prevent lock up under heavy braking - yes - high score, no -low score	6.9	7.5	8.7	7.8	DX,HX,DR,YR
Was the car stable under braking with this tyre? Yes - high score, No - low score.	7.5	7.4	7.9	7.7	DX,HX,YR,DR
Did the car have brake shudder with this tyre? Yes - high score, no - low score (inverse score for merit)	3.9	5.1	4.3	4.8	YR,DX,HX,DR

From the above table of Driver Feedback overall order of merit is- Dunlop X ply, Hoosier X ply, Dunlop Radial, Yokohama Radial. * DX wheel balance problems at QR due to rims supplied.

Additional Performance Data.

Tyre	Corner Barbagallo	MID CORNER SPEED	MID CORNER LATERAL G	BRAKING G	TOP SPEED / ENGINE RPM / LAP TIME
YOKOHAMA	1	93.8	1.35	0.65	
Radial	4	116.3	1.16	0.77	172.8/5805/1.09.34
	6	109.1	1.42	0.51	
	7	84.6	1.46	1.05	
DUNLOP	1	90.8	1.37	1.02	
Radial	4	117.7	1.18	0.6	172.6/5796/1.09.37
	6	103.9	1.34	0.34	
	7	90.5	1.29	1.02	
DUNLOP	1	100.3	1.62	0.71	
Cross Ply	4	122	1.18	0.55	166.4/5384/1.07.70
	6	115	1.63	0.53	
	7	103.4	1.29	0.95	
HOOSIER	1	98.5	1.47	0.81	
Cross Ply	4	119.5	1.23	0.55	165.7/5357/1.08.30
	6	112.3	1.69	0.49	
	7	103.8	1.25	0.79	

Data Source- Austin Pearson, Barbagallo, Test 4
Durometer readings end of test YR-75, DR-69, DX-72, HX-69

Lap Times

Averaged Type	**Yokohama Radial**	**Dunlop Radial**	**Dunlop Cross Ply**	**Hoosier Cross Ply**
Test 1	62.55	62.7	61.4	61.5
Test 2	89.6	89.6	87.35	88.3
Test 3	111.4	110.4	108	109.1
Test 4	69.35	69.3	68.09	68.77

Average lap time comparison

Tyre Performance Drop Off

Generally front running cars would consider a performance drop off of ½ second sufficient to change to new tyres, for purposes of comparison we are using ¾ second.
Performance drop off varies greatly from track to track; QR, Wakefield, Winton and Mallala all appear not to be tyre sensitive to drop off, all other tracks have varying degree of drop off with SMSP recording the worst (which is normally 2 race meetings on the Yokohama tyres).
At test 3 SMSP the Yokohama drop off was recorded at 0.8 seconds after the tyre had completed 11 heat cycles over a period of 2 months, this would equate to less than 3 race meetings. All other tyres gave minimal drop off times.

At Test 4, Barbagallo the Yokohama drop off was recorded at 0.4 second after 12 heat cycles. Extrapolated out this would give the tyre a life of 23 heat cycle. This would equate to 6 race meetings. Due to timer malfunction the Dunlop Z3 drop off was not recorded however the driver reported that he could not detect any difference between sets 1 and 2, going off lap time comparisons (SMSP and Barbagallo) there may have been some.

Wear

	Yokohama	Dunlop	Dunlop	Hoosier
Type	**Radial**	**Radial**	**Cross Ply**	**Cross Ply**
Tread Depth mm.	YR1	DR1	DX1	HX1
New	5.2	4.5	3.9	5.2
End	4.4	3.7	3.3	4.0
Wear	0.8	0.8	0.6	1.2
Available tread	5.2	4.5	3.4	4.7
Wear/ race meeting	0.20	0.20	0.15	0.30
50% adjustment	0.30	0.30	0.23	0.45
No. Races meetings	17	15	15	10

Note- Radials measured from tread depth wear indicator.
Wear has been averaged across X Ply tread.
Cross ply tyres allow minimum tread depth of 0.5mm.

Wear v's Performance drop off
Based on usable tread or 3/4 second performance drop off, whichever the lesser.

Yokohama Radial	6 race meetings
Dunlop Radial	15 race meetings
Dunlop X ply	15 race meetings
Hoosier X ply	10 race meetings

Buffing

Yokohama, from experience small gain in buffing not worth expense
Dunlop Z3, Dunlop claim no advantage, weight reduction may help? Would ½ tyre life from buffing.
Dunlop CR82, small tight tread depth to start with, no advantage.
Hoosier may gain some improvement by limiting tread block squirm.

Fit for purpose

All tyres tested would fall within current 2019 rules as far as ride height and overall width.
It should be noted that the extra weight of radials would contribute to some extent to component wear and life. Competitors are responsible for their own cars maintenance and safety.

Timing and Wear Data

TEST 1		**Track-**	**Baskerville**		
	Yokohama	Dunlop	Dunlop	Hoosier	
Type	Radial	Radial	Cross Ply	Cross Ply	
	YR1	DR1	DX1	HX1	
Sessions					No. Laps/ Driver/ Time
1	8/DW/65.3	8/WM/62.9	8/JC/67.3	8/NC/61.5	
2	8/WM/62.8	8/DW/63.8	8/NC/61.4	8/JC/64.4	All cars 1200s
3	8/JC/65.3	8/NC/62.5	8/DW/63.4	8/WM/61.5	
4	8/NC/62.3	8/JC/65.1	8/WM/61.4	8/DW/63.4	
No. Laps	40	40	40	40	Laps include out and in.
No. Klms	80.4	80.4	80.4	80.4	Baskerville = 2.01 Klms.
Previous	0	0	0	0	Include previous testing Klm.
Total Klms	80.4	80.4	80.4	80.4	
Tread 1	5.2	4.6	3.9	5.2	Start Test Tread Depth mm.
Tread 2	5.2	4.5	3.8	5.0	End Test Tread Depth mm.
Total Wear	0	0.1	0.1	0.2	Total wear at this test (ave. of 4 tyres)
Ave. time	63.9	63.6	63.4	62.7	
best time	62.3	62.5	61.4	61.5	

Note- all cars set up for Radials except NC car set up for X Ply

TEST 2		**Track-**	**QLD. Raceway**		
	Yokohama	Dunlop	Dunlop	Hoosier	
Type	Radial	Radial	Cross Ply	Cross Ply	
	YR1	DR1	DX1	HX1	
Sessions					
1	6/AH/-	6/DH/90.6	6/BN/87	6/CP/87.5	No. Laps/ Driver/ Time
2	6/DH/-	6/AH/-	6/CP/87.7	6/BN/88	All 1600s
3	6/CP/88.2	6/BN/90	4/DH/-	6/AH/-	
4	6/BN/91	6/CP/88.3	1/AH/-	6/DH/89.4	Note- out of balance rim on DX1
					Limited results
No. Laps	32	32	25	32	Laps include out and in.
No. Klms	100	100	78	100	QRW = 3.121 Klm.
Prev.	80.4	80.4	80.4	80.4	
Tot. Klms	180.4	180.4	158.4	180.4	Include previous testing Klm.
Tread 1	5.2	4.5	3.8	5.0	Start Test Tread Depth mm.
Tread 2	5.0	4.3	3.7	4.6	End Test Tread Depth mm.
Tot.Wear	0.2	0.2	*0.1	0.4	Total wear at this test (ave. of 4 tyres)
Ave. time	89.6	89.6	87.35	88.3	

Note- all cars set up for Radials except BN car set up for X Ply

*DX1 completed less laps, therefore less wear, laps made up at SMSP test

TEST 3		**Track-**	**SMSP**					
	Yokohama	Dunlop	Dunlop	Hoosier	Yokohama	Dunlop	Dunlop	Hoosier
Type	Radial	Radial	Cross Ply	Cross Ply	Radial	Radial	Cross Ply	Cross Ply
	YR1	DR1	DX1	HX1	YR2	DR2	DX2	HX2
Sessions								
1	5/MK/111.4	2/TB/0	7/AL/107.8	5/DT/108.5				5/CS/109.8
2	5/AL/111.4	5/DT/110.1	MK/0	TB/0	5/AW/-		5/CS/108.3	
3		5/AL/110.7		5/MK/109.5		5/CS/110.8		5/DT/109.8
4			8/CS/108.1		5/MK/111.0	5/AL/111.0	5/DT/109.0	
	AW/123.3				AW/118.0			
No. Laps	14	14	19	14	14	14	14	14
No. Klms	55	55	74.7	55	55	55	55	55
Prev	180.4	180.4	158.4	180.4	Laps include out and in.			
Tot. Klms	235.4	235.4	233	235.4	Include previous testing Klm.			
					SMSP = 3.93 Klms.			
Ave. time	111.40	110.40	108.00	109.10				
					Bedding tyres			
Set 1	111.4	110.7	107.9	109.5	Ave. Sessions			
Set 2	111.0	111.0	108.3	109.8	Track slower in afternoon			
drop	0.4	0.3 -	0.4 -	0.3-	Tyre 2 -Tyre 1			
	0.8	0.1	0	0.1	Set DX as zero			
Tread 1	5.0	4.3	3.7	4.6	Start Test Tread Depth mm.			
Tread 2	4.7	3.9	3.4	4.3	End Test Tread Depth mm.			
Total	0.3	0.4	0.3	0.3	Total wear at this test (ave. of 4 tyres)			

AW own set 1=12 heat cycles, set 2 new; AW bedded YR2

Note- all cars set up for Radials except TB car set up for X Ply, MK altered for different tyres.

Extra Laps on DX1 to make up for QR test. Therefore more wear.

No. Laps/ Driver/ Time

TEST 4		Track-	**Barbagallo**					
	Yokohama	Dunlop	Dunlop	Hoosier	Yokohama	Dunlop	Dunlop	Hoosier
Type	Radial	Radial	Cross Ply	Cross Ply	Radial	Radial	Cross Ply	Cross Ply
	YR1	DR1	DX1	HX1	YR2	DR2	DX2	HX2
Sessions							1200s	
1	7/AP/69.3	7/RL/69.5	7/JC/68.8	7/DC/0	nil	7/BS/72.4	7/ML/0	7/FE/72.2
2	DNS/RL	7/AP/69.5	7/DC/67.6	7/JC/69.4	7/BS/73.1			
3	DNS/JC	7/DC/68.9	7/AP/67.7	7/RL/68.6	own ML/0			
4	7/DC/69.4	7/JC/0	7/RL/68.26	7/AP/68.3	ownFE/73			
5		7/FE/73.7	7/BS/71.1	7/ML/0	7/DC/69.0	7/JC/0	7/RL/68.6	7/AP/68.4
6		7/ML/0	7/FE/71.0	7/BS/0				
No. Laps	18	36	36	36	Laps include out and in.			
No. Klms	43.4	86.8	86.8	86.8	Barbagallo = 2.41 Klms.			
Previous	235.4	235.4	233	235.4	Include previous testing Klm.			
Tot.Klms	279	322	320	322				
1200					YR1 rims fouled caliper, missed 2 sessions.			
1600								
time Set 1	69.40	NT	68.26	68.30	NT = no time recorded			
time Set 2	69.00	NT	68.60	68.40				
Time drop	0.40	0.00	-0.34?	-0.10	Tyre 1 -Tyre 2 Sess. 4 / 5 1600s			
Tread 1	4.7	3.9	3.4	4.3	Start Test Tread Depth mm.			
Tread 2	4.6	3.7	3.3	4.0	End Test Tread Depth mm.			
Total Wear	*0.2	0.2	0.1	0.3	Total wear at this test (ave. of 4 tyres)			
	4.5mm							
Ave. time	69.35	69.3	68.09	68.77	Ave. Sessions 1600s			
Best Time	69.3	68.9	67.6	68.3				
Ave. times	73.1	73.7	71.0	72.2	Ave. Sessions 1200s			

Note- all cars set for Radials except AP adjusted car to suit X Ply runs.
No. Laps/ Driver/ Time; Note- JC lap timer problems
*Adjust YR1 wear; 18/36 x 0.1mm = 0.2mm

Pricing

Please note that in providing this pricing we have stripped away all vendor rebates and replaced them with 1 common rebate across all tyres (See BOM Notes). This is so that we can compare products fairly. The amount of rebate has been determined at $150 per set which will allow the FVAA to continue to provide support to National events and other research for the benefit of all Formula Vee. The money funds FVAA and how it is spent is decided by the BoM. It could be spent elsewhere but recently it has mostly been spent on National Challenge travel money. The rebate figure is already included in the pricing table below.

In addition, the NTC has attempted to estimate approximate tyre life based on the wear measured over the course of testing. This data may not reflect your driving style or track. It may also not give a true indication of when tyres stop performing at their best. It is however as close as we could get. In providing this estimate we have divided the cost by the number of meetings so that we can get an idea of the true cost of tyres. We have also halved the tyre life based on Front running 1600 racing conditions and an abrasive track.

Tyre Life/Cost based on Wear or ¾ Second Dropoff

Tyre	Front	Rear	Cost per Set	Est Meeting Life	Midfield Est Cost per Meet	Est Meeting Life	Front Runner Est Cost per Meet
Hoosier	$257.50	$272.50	**$1,060.00**	10	**$106.00**	5	**$212.00**
Dunlop Xply	$224.50	$257.50	**$964.00**	15	**$64.27**	7.5	**$128.53**
Dunlop Radial	$208.00	$208.00	**$832.00**	15	**$55.47**	7.5	**$110.93**
Yokohama	$194.50	$204.50	**$798.00**	6	**$133.00**	3	**$266.00**

Tyre Life/Cost Based on Wear Only

Tyre	Front	Rear	Cost per Set	Est Meeting Life	Midfield Est Cost per Meet	Est Meeting Life	Front Runner Est Cost per Meet
Hoosier	257.5	272.5	**$1,060.00**	10	**$106.00**	5	**$212.00**
Dunlop Xply	224.5	257.5	**$964.00**	15	**$64.27**	7.5	**$128.53**
Dunlop Radial	208	208	**$832.00**	15	**$55.47**	7.5	**$110.93**
Yokohama	194.5	204.5	**$798.00**	17	**$46.94**	8.5	**$93.88**

Est Cost midfield driver
Est cost national level podium finisher

BOM Notes

Your BOM has commissioned the tender process, instructed the NTC to carry out testing and evaluated the results provided above. We are comfortable that the process has been conducted in an unbiased manner and has produced sufficient data to be presented here.

The BOM have analysed the expected tyre throughput and unanimously agreed on a set tyre rebate of $150 to be applied to each set of 4 tyres regardless of tyre supplier. This figure will enable FVAA to continue to support national events and other causes deemed by the BOM to be beneficial to our sport. Overall it was determined as the best figure to support FVAA going forward by your BOM representatives.

The BOM have reviewed the tyre life components of the NTC report and have considered that under racing conditions with certain drivers in top HP cars on certain tracks the wear may be greater than the test results represent. As such we have included additional columns in the pricing section to address this by way of halving estimated tyre life. This figure was agreed by all BOM members present.

At this stage the BOM have voted not to provide our individual opinions and therefore have no influence on the final result. We believe the drivers of this country are capable of making a considered decision and leave it entirely up to them to vote for the best option.

Conclusion

The final conclusion of this process is now up to you. Attached is all of the information we have been able to gather and we have attempted to remove emotion or any predisposition from the process and simply present facts and opinions. In the interest of the future of Formula Vee Racing, we encourage you to discuss this with your racing peers, maybe even with the manufacturer of your cars and your mechanical team to help you to cast your vote in an informed manner.

State Committees please discuss within your state and decide who will vote and how they will vote. Then conduct your vote and assign your state's 1 vote to your BOM representative. The BOM will accept each state's vote and make a final decision before notifying Vendors and making the result public.

Formula Vee offers a fantastic opportunity for all drivers to take part in a competitive, cost effective motorsport. Whatever the result, we hope everyone will appreciate a fair decision has been made and know that we will support that decision by bolting on the chosen tyre and racing as hard as we can.

Thank you for your participation,

Your Board of Management (BOM).