A tyre safety study in Qatar and application of immersive simulators

Phase 1 Results
QP social responsibility to...

- >55,000 Employees in Oil & Gas*
- >120,000 Employees in Energy & Industry*

*QSA 2010

Qatar: 12 Fatalities per 100k Population / 2012!
National Road Safety Strategy
“Safe Road Users, Safe Vehicles, Safe Roads, Safe Speeds”

Action Items

1.17 - To complete an audit of research on road safety conducted in Qatar to identify knowledge and gaps. ...

3.10 - Investigate the safety of balloon tyres and develop policy and enforcement methods as required.

3.11 - Establish and implement a proactive “in use” inspection policy. Train the police in delivery of targeted enforcement of vehicle standards.

3.12 - Develop a targeted enforcement strategy based on the analysis of crash data, periodic inspection failure statistics, and a survey of vehicle defects.

“Conduct research to find causes of vehicle tyre failure and develop measures to reduce road accidents.”
Tyre Safety Study

Objectives

- Identify the playing field
  - International

- Understand the state of play
  - Qatar

Work carried out:
1. Tyre standards
2. Tyre survey
3. Vehicle survey
### Governmental

**Ministry of the Interior**  
Traffic Department  
FAHES

**Ministry of Business & Trade**  
Consumer Protection Department

**Ministry of the Environment**  
Qatar General Organization for Standards and Metrology

---

### Regulatory

<table>
<thead>
<tr>
<th>Requirement</th>
<th>FMVSS</th>
<th>EEC</th>
<th>GSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tyre Marking</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dimensional Conformity</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tread Wear Indicators</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bead Unseating Resistance</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Tyre Breaking Strength</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endurance</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Low Inflation Performance</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Speed Performance</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tread Tensile Strength</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>UTQG - Temperature</td>
<td>X</td>
<td></td>
<td>(A or B)</td>
</tr>
<tr>
<td>UTQG - Traction</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UTQG - Tread Wear</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolling Resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Speed Rating</td>
<td></td>
<td></td>
<td>X (S)</td>
</tr>
</tbody>
</table>
The playing field – climatic

Mean Monthly Temperature (degC)

Mean Monthly Relative Humidity

Mean Monthly Minimum and Maximum Temperatures

Mean Monthly Number of Hours of Sunshine
• Electronic survey (153 Arabic, 655 English)
  – 808 responses in 6 organisations

• 41 nationalities represented
  – 36.6% Indian, 11.4% Filipino, 10.7% Qatari
  – Majority male, married, educated

• 20.7% do not routinely maintain tyre pressures.
  – 35% did not for lack of knowledge

• 23.4% correctly identified the tread depth at which a tyre should be replaced

• 19.9% reported that they drive in the desert
  – Of these 17.6% use balloon tyres,

• 31% correctly identified tyre sidewall speed rating
• 61% correctly identified tyre’s year of manufacture
• 23% correctly identified proper replacement tread depth
239 vehicles were surveyed for tyre data during FAHES annual inspection

102 sedans / 84 sport utility vehicles / 44 trucks / 7 vans / 2 sports cars

4.2% were equipped with desert balloon tyres. These were not failed at inspection.

10.5% failed inspection due to tyre related infractions (e.g. Tread depth).

12% of recorded tyres had speed ratings below minimum legal requirement of “S” (180 km/h) rating.

New tyres older than 2 years still appear to be available for purchase despite ban.

<table>
<thead>
<tr>
<th>Matching Relationship</th>
<th>Number of Vehicles</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>All tyres on the vehicle are of the same type</td>
<td>142</td>
<td>59.4</td>
</tr>
<tr>
<td>Axle pairs have matching tyres</td>
<td>41</td>
<td>17.1</td>
</tr>
<tr>
<td>Vehicle side (left / right) pairs match</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>One tyre is different than the rest</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>Assortment of diagonal matches</td>
<td>23</td>
<td>9.6</td>
</tr>
<tr>
<td>All tyres are different</td>
<td>9</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Survey responses from 808 participants showed improper use of tyres and lack of education about tyre use and maintenance.

From vehicles surveyed at FAHES station, it is clear that banned balloon tyres are still allowed and used by drivers on normal roads.

Qatar has comprehensive tyre standards but climate poses a significant challenge to tyres under normal usage. Standards/tests do not cover this.

Studying available reports to date showed that car tyres cannot be proven to play a leading role in fatal accidents due to insufficient accident data.

Proactive enforcement of related tyre regulations appears to be lacking.
Recommendations

**Structural**

1. Introduce road safety manual containing pertinent traffic law information for drivers including tyre information. Produce in multiple common languages.

**Operational**

1. Institute yearly vehicle technical inspection, after 1\textsuperscript{st} year of service.

2. Strengthen vehicle inspection standards & enforcement

3. Categorically outlaw balloon desert tyres and aggressively enforce.

4. Randomly select tyre imports for conformance testing.

5. Increase retail tyre supplier inspections to insure conformance.
Recommendations

**Behavioural**

1. Conduct education campaign to stress tyre maintenance importance. Expand tyre DOT code awareness campaign to include other relevant tyre attributes.

2. Provide tyre pressure gauges at vehicle and tyre points of sale.

3. Increase free access to tyre fill stations. Investigate tyre filling during refueling.

4. Ensure vehicle service centers are performing tyre maintenance.

5. Investigate lowering or controlling the prices of renewal tyres.

**Empirical**

1. Conduct tyre testing to confirm regulatory standards are sufficient for Qatar’s environment.

2. Quantify tyre performance as a function of accumulated thermal life of tyres in Qatar.

3. Quantify tyre dynamics during desert driving.

4. Quantify accumulated experience of repeated desert driving.

5. Quantify the quality of roads in Qatar.
Skid resistance testing by TAMUQ
  • On Qatar roads

Empirical tyre testing to modified test specifications
  • Qatar specific conditions
Simulator system components & considerations:

- Visual system (FOV, type, refresh, res)
- Control systems (feedback, feel, motion cueing)
- Software systems (VeD, VE, AI, audio, rendering)
- Mechanical systems (cockpit interior, trailer, etc)

Simulators provide:

- Training in fully controlled environment
  - Safe
  - Scenario based
  - Environmental conditions
  - Customisable
  - Repeatability
  - Feedback

Tyre Safety Study
Simulator components
Tyre Safety Study
Driving simulator for QP

- Tire conditions
- Vehicle dynamics
- Localised environment
- Road surface conditions
- Driver behaviour
- Localised Traffic simulation (scenarios)
Tyre Safety Study
Williams immersive simulator

- Driver Training Simulator
- ONE SECOND! campaign
A tyre safety study in Qatar and application of immersive simulators

Thank you.