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Sound Steering

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From an end user point of view the assessment criterion is simply how much will the driver or passengers hear the pump noise in relation to the vehicle background noise. That is, will the pump produce audible tones with the vehicle in different operating conditions.

Measuring the noise from the steering pump is complicated by several factors. First, the noise is multi-tonal. It has a lot of background masking and, finally, it is dependent on the engine speed.

During the initial phase of the work several tests were carried out with the aim of identifying a ‘standard’ microphone position from which repeatable results could be gathered. It became clear that an array of microphones was required. After several iterations it was found that data from six microphones arranged in a sphere gave reliable results to account for ‘high spot’ and ‘dead spot’ positions. To remove anomalies, three measurements were taken per test and the results averaged.

An analysis was developed using DATS’ worksheet and scripting language. This averaged the runs and microphones before removing background noise. The pump in question had 10 impellor blades and so 10th, 20th & 30th orders were studied. The duration over which these orders exceeded the background noise was then condensed to a single value. This gave a metric that could be used to compare pumps and sound proofing techniques.