

# Prins VSI II DI vs DLM

or indirect injection versus direct injection – a comparison of systems



**T**HE CRUCIAL QUESTION WHICH CURRENTLY BOTHERS BOTH CONSUMERS AND REPRESENTATIVES OF THE AUTOMOBILE INDUSTRY IS VERY SIMPLE: WHAT KIND OF AN AUTOGAS SYSTEM SHOULD BE INSTALLED IN THE FUTURE - THE NEW GENERATION OF DIRECT LIQUID INJECTION, OR BETTER STILL THE CLASSIC SYSTEMS OPERATING WITH AN EVAPORATOR AND THAT FEED AUTOGAS INTO THE COMBUSTION CHAMBER THROUGH THE SUCTION PIPE? THE CORRECT ANSWER TO THIS QUESTION WAS GIVEN BY THE FRENCH PHILOSOPHER VOLTAIRE, WHO USED ONE OF THE OLD ITALIAN PROVERBS: „ LEAVE WELL ALONE!”

It is true that both systems, based on good, well-designed components, quite effectively lower the cost of fuel and emissions, and even often complement rather than compete with each other. To further examine this issue one should visit the Dutch city of Eindhoven, where clear circumstantial evidence leads. Here, where the Prins company has conducted the first tests with direct injection autogas systems, you can quickly get the answer to the above question as the company offers these two systems at the same time along with the products VSI II DI and Direct LiquiMax and knows best their advantages and disadvantages.

Head of Business Development Department of Prins, Mr. Bas ten Broeke makes himself perfectly clear explaining the pros and cons of both systems. At the current stage of technological development both systems are currently used worldwide and operate, as Prins proudly claims, largely without failure. Largely because in certain extreme conditions Direct LiquiMax system still requires optimization. The ideal solution has not been found yet; the solution which could reconcile some specific climatic conditions, such as extreme heat or cold on one side with various mixtures of gas, such as propane or butane. Bas ten Broeke, however, reassures most drivers: “In the Australian wilderness with temperatures above 45 degrees centigrade in the shade and running on pure propane Direct LiquiMax system now reaches its limits.” Since hardly any European driver of a gas-powered car will ever drive in such conditions, we can easily get over it. In countries such as Turkey, Spain, Thailand, Korea and the USA, as well as during the hot Italian summer DLM systems worked smoothly. Actually, Prins VSI II DI belongs, as you know, to the autogas systems designed for DI engines which do not cause any problems when properly assembled and aligned.

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Head of Business Development Department in Prins, Mr. Bas ten Broeke is explaining the differences between both types of autogas systems and looking to the future. Prins VSI 2.0 Future VSI II systems should theoretically operate well without the use of petrol due to the high efficiency in DI engines.

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### POWER

Let's now get to the reserves. For this purpose we are going to use numerous homologations of both types of autogas systems, which you can always use in order to compare and check specific data. As regards performance, VSI DI II does not display any advantage over the petrol-powered system. However, it is surprising that the power does not decrease in the autogas system as is the case with many solid-injection engines; feature that is hard to find in this form at all producers' of autogas systems. In the case of Direct LiquiMax the situation looks a bit different: measurements on the test stands showed up to 2% more power compared to driving on petrol. Bas ten Broeke, however, plays down high expectations: *"Unfortunately, a driver won't feel it."*

### EMISSIONS

CO<sub>2</sub> emissions is an obvious measure of alternative fuels, especially when it comes to their continued existence on the market. Again, the new technology can offer some benefits here. VSI II DI emits a solid 10-12% less CO<sub>2</sub>. This value is slightly lower than what the published data regarding indirect injection engines provides because, as conditioned by the system factors, less petrol is added to gas, and this of course can be seen in the test report. DLM, which does not require petrol, reaches an average of 14% savings. *"If engines were converted into the monovalent consumption of LPG, it would be possible to achieve at least 16%, and even up to 20% CO<sub>2</sub> savings."*, projects Technical Manager. For that to happen, car manufacturers would have to be prepared for keeping up with us. It gets even more interesting in the case of hazardous dust. While VSI II DI still shows a small amount of residual materials, where in the case of the DLM they have been reduced to 90%, and partly in the peak values, even up to 99%. Residual amounts for VSI II DI are mainly due to the use of petrol, which is necessary to start the engine.

### CONSUMPTION

The use of petrol in the new VSI II DI is at a level below 20%; most cars burn well below 10% of petrol. Then the gas consumption is higher by 20% than petrol consumption. A little more, i.e. 20 to 30% more gas, is required by monovalent DLM, but generally speaking, it is cheaper to run than the VSI II DI.

### PRICE

If we consider the selling price of VSI II DI as 100%, the price in the case of Direct LiquiMax is currently about 25% higher. However, the higher price should quickly depreciate as a result of economical use, so that drivers of cars running on autogas who now want to change their autogas systems can easily choose DLM technology.

### CONCLUSION

The question posed at the beginning of this article whether a classical VSI II DI or new DLM is better has finally been answered. Slightly more power, much better emissions and fuel cost values that are lower than the values in the case of VSI II DI, clearly support the new solution, where autogas is injected in liquid form to the combustion chamber. Even the higher price you still have to pay for the new technology quickly pays for itself. However, the decision is sometimes made by car manufacturers for the client. Bas ten Broeke: *"For certain engines high pressure pumps are designed so that, from a technical point of view, the transition to the DLM is not possible."* Drivers who want to convert to autogas must then choose VSI II DI. Looking to the future of the Dutch producer of autogas systems, a positive development can be forecast: the newly designed controls for VSI II theoretically run entirely without petrol. The only small problem is that still the petrol injectors of direct injection engines get polluted and while working as monovalent on gas with indirect injection, they virtually don't work. If this technical issue got solved, the Prins company would move far ahead of most manufacturers of autogas systems in terms of technology; a jump that would be almost impossible to catch up with. In times of falling turnover it is more than a light at the end of the tunnel ...

Wolfgang Kröger



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