

DISCOVER HOW  
NETWORKING CAN  
STRETCH THE LIFESPAN  
OF YOUR INJECTION  
COMPONENTS!

# L'IQ - INTELLIGENT INJECTORS

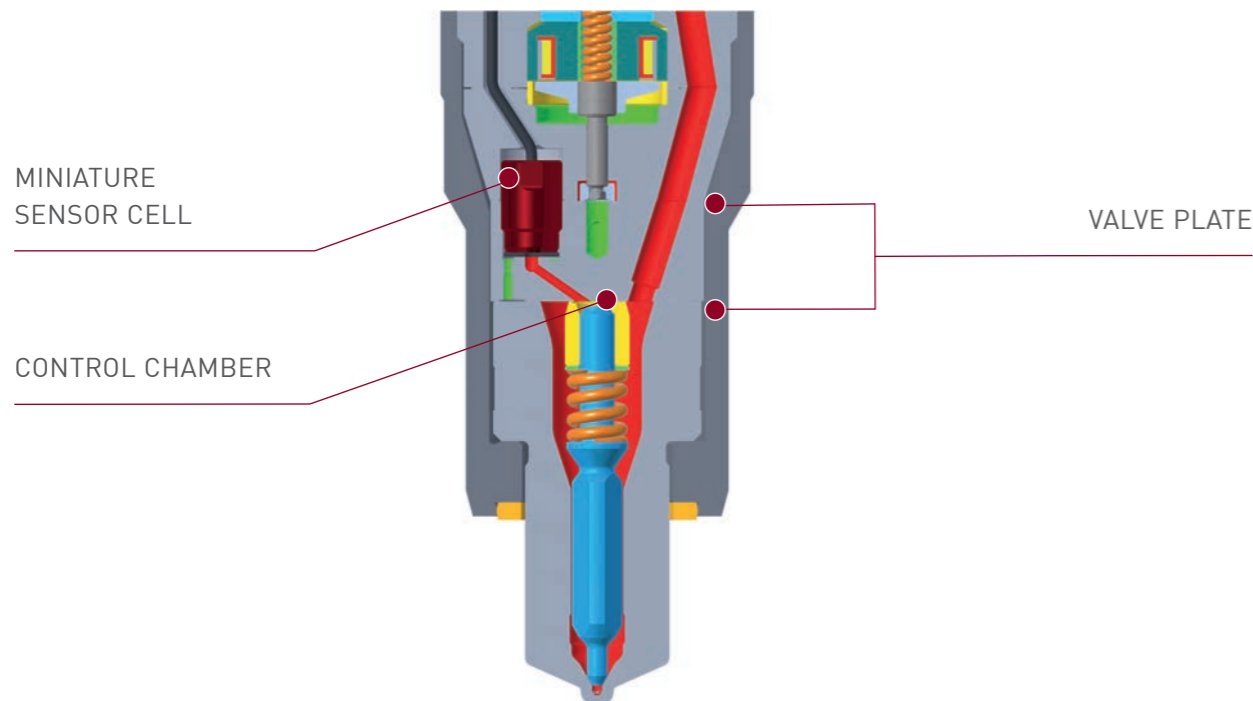
A NEW ERA IN LARGE-ENGINE FUEL INJECTION

## SMART INJECTOR TECHNOLOGY PROMISES TO CHANGE THE WAY COMPONENTS NETWORK AND COMMUNICATE

Since the launch of the first electronically controlled common-rail fuel injection system in 1997, system pressure has more than doubled. This increase has been driven primarily by measures to reduce emissions. Increasingly high injection pressures, however, are challenging for mechanical components especially when used with fuels of lower quality or in rough environments. The requirement to ensure compliant emissions over the entire effective life of a fuel injection component represents a further challenge.

With these issues in mind, Woodward L'Orange has developed smart injector technology – the L'IQ Intelligent Injector – featuring a pressure sensor close to the nozzle which can monitor the injector's function and condition, and communicate its status to the outside world. A closed control loop can be built in to monitor the start and end of injection in view of stabilizing the duration of injection over the effective life of the injector, and therefore enabling a timely response to symptoms of wear and tear.

A PRESSURE SENSOR NEAR THE NOZZLE IN THE INJECTOR OPENS UP THE POTENTIAL TO MONITOR AND COMMUNICATE ITS FUNCTION AND CONDITION.



LOCAL INTELLIGENCE IS INTEGRATED INTO THE INJECTOR – WITH SIGNAL CONDITIONING AND PROCESSING COMPONENTS LOCATED ON OR CLOSE TO THE INJECTOR.

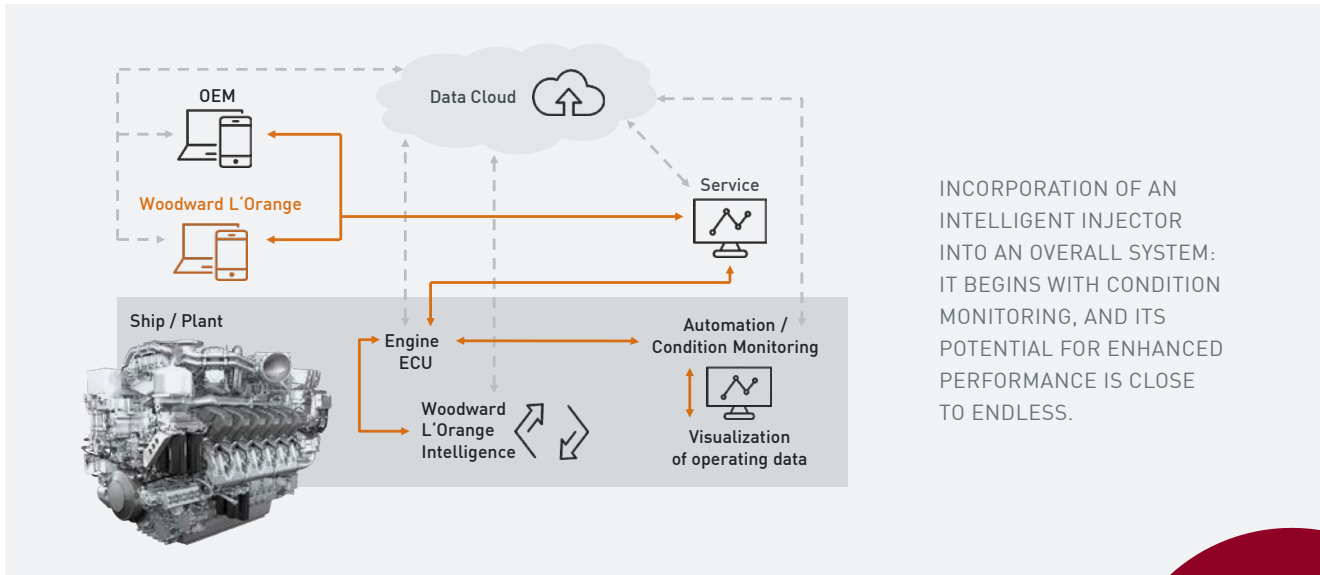
OPTIMIZE THE PERFORMANCE OF YOUR COMPONENTS – WITH OUR NEW L'IQ INTELLIGENT INJECTORS

## CAPITALIZE ON THE FULL POTENTIAL OF INTEGRATED TECHNOLOGY WITH SMART INJECTORS

The L'IQ Intelligent Injector ensures optimized utilization of fuel injection components over time. Here are some of the key benefits you'll profit from:

- The new L'IQ injectors are configured to be smart and communicate with their environment. This opens up the potential for a number of components within a system to exchange data and information, which in turn will lead to optimization of the entire system, sub-systems or superordinate systems.
- Drift compensation, condition monitoring, digital identification of components and a load recorder rank among the basic functions that can be implemented.
- Aging-related changes in injection behavior can be corrected using drift compensation – a decisive factor in controlling operating costs.
- Active condition monitoring contributes to the stabilization of fuel consumption and enables longer exchange intervals. It allows to deduce the injectors' mechanical condition and enables a projection on the end of life of components – a prerequisite for condition-based maintenance.
- Smart injector technology makes a significant contribution to ensuring compliant emissions over the entire effective life of a fuel injection component.
- The smart injectors are service-oriented and user-friendly in practice: they enable simple, fast system analysis and clear, accurate error identification.





INCORPORATION OF AN INTELLIGENT INJECTOR INTO AN OVERALL SYSTEM: IT BEGINS WITH CONDITION MONITORING, AND ITS POTENTIAL FOR ENHANCED PERFORMANCE IS CLOSE TO ENDLESS.

It's hard to imagine a future without smart injection technology. And here at Woodward L'Orange, we are already working on further networking with other engine components, the entire engine system and, of course, a cloud. The functionalities highlighted here cover the basic capabilities of an intelligent fuel injector. When these are implemented along with networking to other engine components, the possibilities for many more functionalities are within reach.

In the future, fuel injection along with combustion will be monitored by electronic systems. This will enable the thermodynamic optimization of combustion based on fuels with strong variations in characteristics, as well as the early detection of unforeseen fuel injection behavior or even engine failure. Moreover, the combination of a combustion chamber pressure indication and injector monitoring could be used to significantly improve analysis of the engine combustion system.

With the intelligent injector, the cornerstone is being laid for the digitalization of individual fuel injection components – and for the ongoing evolution of integrated injection technology.



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