

# New engine pre-chamber improves peaking plant efficiency

CASE STUDY: TYR ENERGY INC.



Upgrading to Wärtsilä's 0.9% pre-chamber provided extra room for improved efficiency and stable emissions.

– The upgrade meant a lot to us, because we used to walk a thin line between heat rates and emission controls when meeting our needs. Now the plant can reach a better balance, says Jesse Song, Asset Manager, Tyr Energy Inc.

Tyr Energy is an investor and developer of North American independent power projects (IPPs). As such, Tyr Energy – a subsidiary of ITOCHU Corporation – currently owns and operates more than 15 IPPs all over North America. ITOCHU also have independent power facilities in Europe and Asia.

In early 2013, the company acquired the state-of-the-art Plains End I & II power plant located close to Denver, Colorado, USA. The plant ensures grid stability and supports the regional renewable portfolio by providing peak load, standby and emergency operating modes for a large part of the Colorado area, extending out to surrounding states. The Plains End power plant

provides a total combined output of 231 MW – from 20 Wärtsilä 18V34SG engines (Plains End I) and 14 Wärtsilä 20V34SG engines (Plains End II) – making it the world's largest natural gas-fired peaking power plant with reciprocating engines.

## NEED FOR EMISSION STABILITY

The Plains End power plant is used as a rapid response to market demand. For example, the plant steps in whenever there is too little wind for the wind turbines to produce needed power or when the power demand is higher than normal.

– The operations before the upgrade were rather good. But under certain conditions, such as fuel

## CHALLENGES

- Stabilising engine raw emission levels without sacrificing heat rate

## SOLUTION

- Installation of upgraded pre-chambers on the engines.
- Fine tuning engine control parameters

## BENEFITS

- Improved combustion and raw emission stability
- Improved efficiency (up to 1%)
- Reduced raw NOx emissions
- Reduced urea consumption in SCR by up to 25%

## “WÄRTSILÄ’S PEOPLE ARE THE BEST WHEN IT COMES TO THIS KIND OF WORK.”

quality fluctuations, the unstable raw emissions before the SCR presented a huge challenge for the urea feed control unit, which could result in unstable stack emissions, says Mr Jesse Song.

One solution would have been to run the engines with higher fuel requirements.

– We, however, don’t have much control over fuel quality. So we decided to go for Wärtsilä’s pre-chamber upgrade instead, says Mr Song.

The pre-chamber is the ignition source for the main fuel charge, and is thus one of the essential components of a lean-burn spark-ignited gas engine. Among the advantages of the new pre-chamber is a more stable combustion, which results in increased emission stability and improved overall efficiency.

Wärtsilä’s pre-chambers play a key role in providing efficient and reliable combustion. In Wärtsilä 34SG engines, for example, they are now an effective tool for optimising combustion dynamics, which can be seen in improved engine performance and a better balance between the heat rate and NOx emissions.

### EXCELLENT PERFORMANCE BY WÄRTSILÄ’S ENGINEERS

In addition to the pre-chamber upgrade, Plains Ends II will also perform the 12,000 and 16,000 running hour overhauls through Wärtsilä.

– The pre-chamber upgrade for all 14 engines in Plains End II went very well and Wärtsilä was able to fulfil our



needs regarding the time schedule. We are certainly happy with Wärtsilä’s work. The 12,000 hrs overhaul is still ongoing since we can only do one engine at a time. The 16,000 hrs overhaul is for the future, says Mr Tommy Arnett, Plant Manager of Plains End and Plains End II.

He describes the performance of Wärtsilä’s people as excellent.

– Wärtsilä’s people are the best when it comes to this kind of work. We are satisfied with both the schedules and the actual work.

No challenges worth mentioning cropped up during the installation of the pre-chambers. The installation was followed by a fine-tuning phase for the emissions levels, where Wärtsilä assisted by providing expertise.

### THE CUSTOMER RECOGNISED THE BENEFITS

Plains End II has a long-term service agreement (LTSA) with Wärtsilä. Nevertheless, Wärtsilä’s phone

support and on-site support after the upgrade project receives high grades.

With the above services covered by the LTSA, the plant management is optimistic about solving various operational challenges. Mr Song and Mr Arnett fully expect to receive good quality timely services from Wärtsilä also in the future.

– Through the pre-chamber upgrade and the scheduled overhauls, the plant is able to burn less fuel to make up for deficits in regional renewable generation when needed. This means that our ecological footprint is more favourable as a result of our environmental responsibility to the local community.

Plains End II was able to clearly recognise the benefits of a pre-chamber upgrade.

– Considering the benefits over the costs, the upgrade is worth doing, concludes Mr Jesse Song.