

The Cheng Cycle Engine For Economic Results

International Power Technology

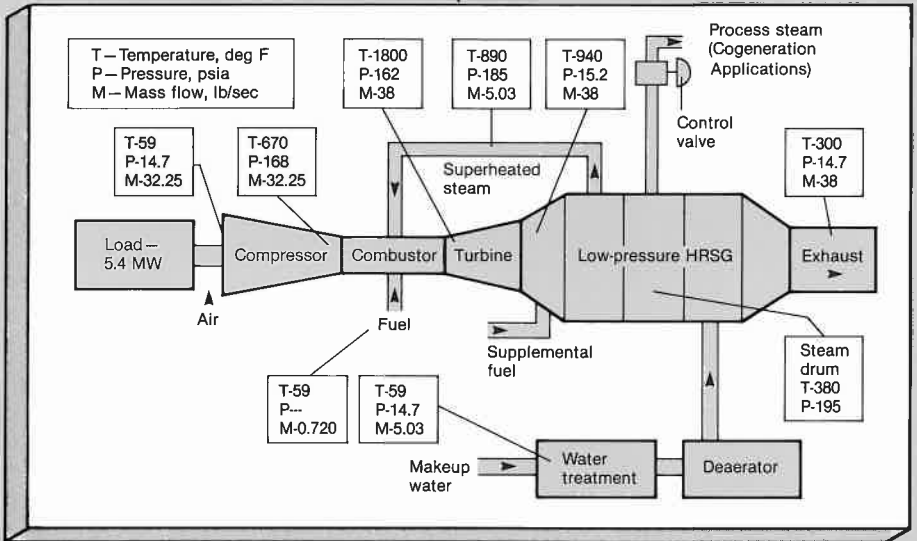
International Power Technology was formed in 1974 by Dr. Dah Yu Cheng to develop and commercialize the Cheng Cycle Engine. Years of development effort have resulted in an engine technology which will significantly impact the turbine industry. With the cooperation of Detroit Diesel Allison, this technology is now commercially available.

The Cheng Cycle Engine

The patented Cheng Cycle Engine is based on combining the Brayton (gas turbine) and Rankine (steam turbine) thermodynamic cycles in a manner which optimizes efficiency and minimizes mechanical complexity. In its commercial form, the engine consists of a modified gas turbine, waste heat recovery steam generator, and a microprocessor based control system.

The Cheng Cycle is simple in concept. Superheated steam produced from the gas turbine exhaust is injected back into the combustor region of the turbine. The increased mass flow produces additional work with little additional fuel. The result is dramatically higher power output and fuel efficiency than simple cycle turbines, with little additional mechanical complexity.

Although gas turbine steam injection is an old concept, the operational parameters had never been optimized. By recognizing that this process represents a combination of the Rankine and Brayton cycles, Dr. Cheng was able to understand and patent the operational regime which produces optimal results. The modified gas turbine, steam generator, and control system are designed as an integral package which capitalizes on this operational regime. This integral package constitutes the Cheng Cycle Engine.



DDA 501K based Cheng Cycle Engine operating parameters at full rated output
From Power, a McGraw-Hill Publication, February 1983

Cheng Cycle Engine Advantages

Advantages of the Cheng Cycle Engine are as follows:

- High power output
- High thermal efficiency
- Low mechanical complexity
- Long engine life due to less thermal cycling in cogeneration applications
- Low NOx emissions due to steam injection

These advantages combine to produce the most valuable commodity:

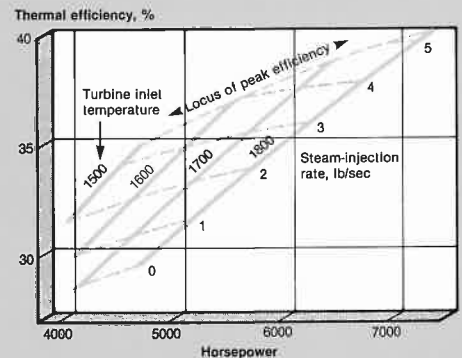
ECONOMIC RESULTS

501 Based Cheng Cycle Engine

As applied to the DDA 501 gas turbine, Cheng Cycle technology produces results which are nothing short of startling. Power output is increased by over 60%, from 4380 to over 7200 Hp. Thermal efficiency is increased by over 40%, from 28% to nearly 40%.

The gas turbine is modified by DDA for International Power Technology, and carries the 501 KH designation. This modified turbine has DDA's full warranty support for Cheng Cycle operations.

The DDA 501K based Cheng Cycle Engine is available now from International Power Technology. The turbine, boiler and control system are packaged by International Power Technology. Application specific packaging (cogeneration, generating set, compressor drive, etc.) is performed by licensed DDA distributors in close cooperation with International Power Technology.



DDA 501K based Cheng Cycle Engine performance curves

From Power, A McGraw Hill Publication, February 1983

Applications

The Cheng Cycle Engine has a wide range of applications:

- Cogeneration
- Mechanical drive
- Power generation

Cogeneration

Many potential cogeneration applications are stymied by thermal load fluctuations. Simple cycle gas turbine systems are often required to derate, vent exhaust, or shut down to accommodate reductions in thermal demand. Each of these options carries a significant economic penalty. The Cheng Cycle Engine eliminates these problems without adding mechanical complexity.

Steam injection can be varied from zero to all produced by the waste heat boiler. Periods of low thermal demand are translated into revenue generating opportunities because of higher power output and greater fuel efficiency.

Mechanical Drive

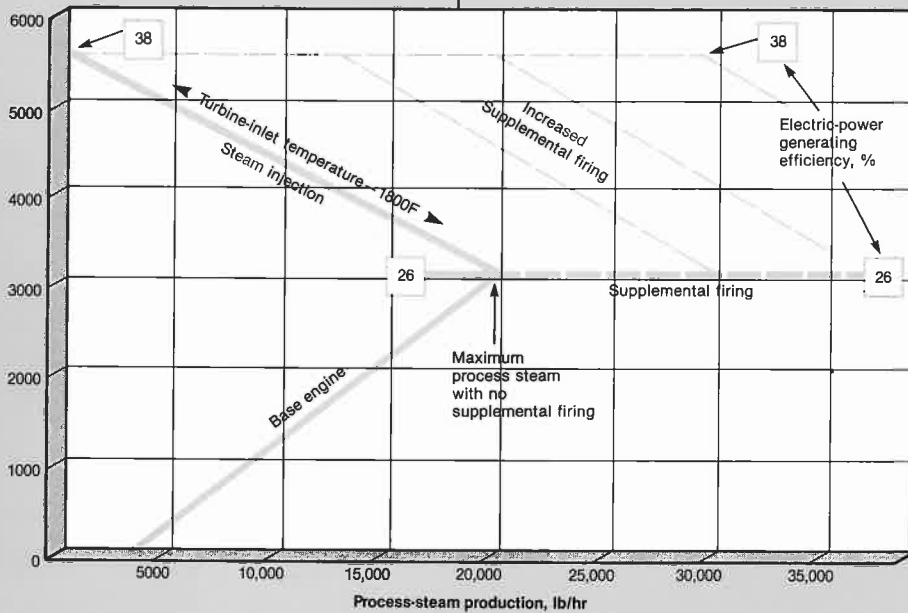
Today's high fuel prices have forced industry to focus on energy efficiency. The extremely high thermal efficiency of the Cheng Cycle Engine translates directly into bottom line results. In addition, the mechanical simplicity of the Cheng Cycle Engine guarantees operating reliability. Regardless of the application, the Cheng Cycle Engine promises to set a new standard for efficiency and reliability.

Power Generation

The Cheng Cycle Engine is ideal for baseload power generation applications. Performance which was once available only in large combined cycle plants is now available in compact, integrated packages with greater reliability. Potential applications range from remote industrial sites to small municipal utilities and distributed power generation for large utilities.

International Power Technology's Commitment

International Power Technology is committed to producing economic results for its customers. Our feeling is that no matter what the application, economic results are the Cheng Cycle Engine's strongest point. We work closely with clients in developing systems which exactly fit their needs, and base our recommendations on detailed economic analyses. Our advanced technology and results-oriented commitment ensure customer satisfaction.



DDA 501K based Cheng Cycle Engine operating regime in cogeneration

From *Power*, a McGraw Hill Publication, February 1983

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