Three-dimensional multistage rotary engine with external combustion chamber

> Dieter Schaller Stuttgart Germany

01.06.2010

Rotary Turbine

Subjects

Geometric Design

- Vast variety of Rotary machines
- From 2 dimensional to multistage 3 dimensional

Multi fuel combustion chamber

The energy source

Sealing of multi stage working chambers

A different approach

Power Generation and dynamic response

– Power like a turbine, dynamic like a piston Engine

Visions

- Power to make it real

01.06.2010

Rotary Turbine

<u>Geometric Design</u>

A vast variety of rotary machines

- Most famous representative: "Wankel engine"
- Rotary engines are having great advantages.
- There is a vast multitude of working principles.
 Felix Wankel for instance made a summary of known constructions.
- But Rotary Engines for power generation had no real "break through" up to now.
- Expanding from 2 dimensional designs to the 3rd dimension, as to be presented, offers new chances and challenges to put it widely on the road.

From 2 dimensional to multistage 3 dimensional



2D animation of working principle Rotary Turbine

01.06.2010

From 2 dimensional to multistage 3 dimensional



Opening the 3rd Dimension

01.06.2010

Rotary Turbine

From 2 dimensional to multistage 3 dimensional



3D Working Cambers

01.06.2010

Rotary Turbine

From 2 dimensional to multistage 3 dimensional



"V" Type inner shafts

01.06.2010

Rotary Turbine

Geometric Design From 2 dimensional tomultistage 3 dimensional



Multi Fuel Combustion Chamber The Energy source

- E = P*V = k*T = f(T)
- Similar principle like jet combustion chambers.
- But especially designed for multi fuel capability.
- Except gas and liquids, the engine is very much suited to use solid mineral or biological fuel.
- The solid combustion remises as ashes can play a positive role in this use case.

.....

Multi Fuel Combustion Chamber The Energy source



01.06.2010

Sealing of multistage working chambers A different approach

- Rotary machines show elegance and beauty.
- They charm by their simplicity and advantages.
- But suffer mostly from insufficient or difficult sealing.
- This is due to the rigid thought to use them like reciprocating engines.

Different approach:

- Due to their concept, rotary machines should be used at high rpm's.
- More suited as expanders than compressors.
- Sealing should be dry using
 - Rolling contact
 - Narrow gaps
- Due to multi stage chambers of the presented engine, energy loss occurs only from one stage to the other.
- Due to "V" shafts, gaps can be easily optimized even during operation, to minimize losses and to compensate thermal influences.

01.06.2010

Rotary Turbine

Sealing of multistage working chambers A different approach



01.06.2010

Rotary Turbine

Sealing of multistage working chambers A different approach



Minimizing Gaps by sliding inner rotor into casing

01.06.2010

Rotary Turbine

Power Generation and Dynamic Response

Power Generation like a turbine, Dynamics like a piston engine

 Turbines are powerful engines in many aspects, but are not suitable for road applications because of

- poor efficient level at idle.
- delayed response to changes in power settings

The shown rotary engine has similar functional principles like a turbine, but has outstanding advantages in those two subjects.

Advantages are achieved by control of hot gas inlet.

- Due to tight working chambers there is no throttle impact.
 (Similar to valve controlled inlet on piston engines) Therefore a good efficiency even at idle or low power should be expected.
- High dynamic response will be achieved by quick and simple control of amount of hot gas inlet.

01.06.2010

Rotary Turbine

Power Generation and Dynamic Response

Power like a turbine, dynamic like a piston engine

Low Power / Idle

High Power

Achieved by different extent of covering the inlet area.

01.06.2010

Rotary Turbine

Visions Power to make it real

- Power-Weight ratio of burning material is still outstanding compared to other mobile energy sources.
- Oil however will cease and we have to use solid or biological fuel.
- The existing infrastructure will be able to handle solid or biological fuel without significant additional investment.
- Take from and give back to Nature is a basic law for our world. Take the material and give back the ashes as Fertilizer.
- The demonstrated engine promises to be effective and uncomplicated. Production costs should be significant lower than todays engines.
- It offers a new promising principle in generating mobile power.
- It offers an outstanding ability to use low sophisticated or only slightly processed biological fuel. By that making it very easy and attractive to keep CO2 in rotation within the Biosphere.

01.06.2010

Rotary Turbine