

# Study on the Low-NOx Maximized-efficiency Optimized Reheat-cycle Gas Turbine Combined-cycle Power Generation System

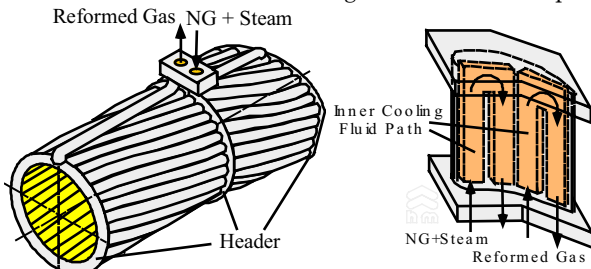
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## 1. Introduction

The Low-NOx Maximized-efficiency Optimized Reheat-cycle Innovative Gas Turbine Combined-cycle (MORITC) with combination of advanced technologies and new concepts will be proposed.

## 2. Methane Reforming Cooling Method

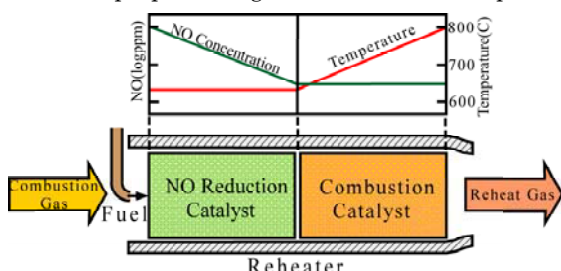
Improving efficiency, it is necessary to develop the new cooling method to cool the hot gas parts. The new concept of cooling method using methane steam reforming reaction is thought out and adopted to combustor and turbine bucket. Figure 1 shows concepts.



**Fig. 1 New cooling combustor and turbine bucket**

## 3. NOx Reduction Catalytic Reheater

The new concept of reheater reduced NOx with fuel is proposed. Thermal NOx produced at high pressure combustor can be converted to nitrogen using NOx reduction catalyst [1]. The NOx reduction catalytic reheater is proposed. Figure 2 shows its concept.

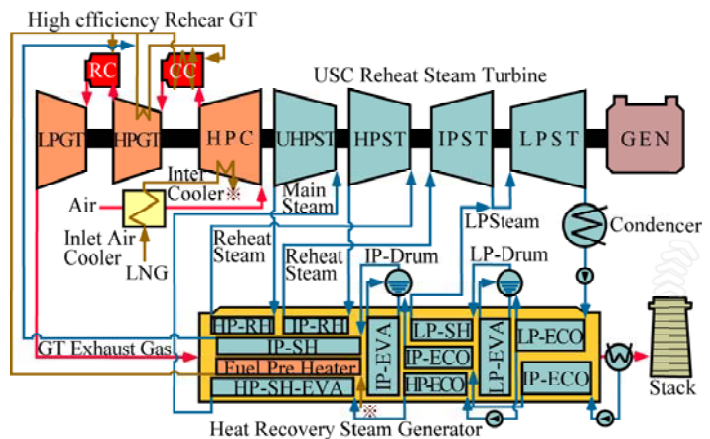


**Fig. 2 NOx reduction catalytic reheater**

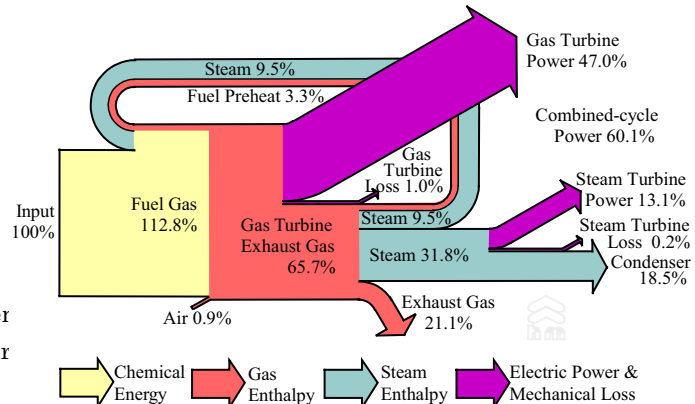
## 4. Proposal of MORITC System

Based on above-mentioned results, MORITC system is proposed. The conceptual figure is shown in Figure 3.

3. The mass and heat balance is calculated using the performance analysis program. The heat flow diagram of MORITC is shown in Figure 4 [2]. As the result of calculation, the condition of pressure ratio being 55, high pressure TIT being 1700°C, low pressure TIT being 800°C, the generator end efficiency of combined cycle will gain 60.1%(HHV), 66.7% (LHV). This result is more than six point improved from that of 1500°C-class gas turbine combined-cycle. In case the inlet air ratio is supposed 586kg/sec, generator end the output power of MORITC will reach 623MW. This performance will be given the highest value of gas turbine combined cycle in near future.



**Fig. 3 MORITC system schematic flow diagram**



**Fig. 4 MORITC thermal flow diagram**

## References

- [1] Ozawa Y., *Petrotec, Int.* Vol.19(1996), pp.284
- [2] Moritsuka H. and Koda E., *IGTC*, TS18 (1999)