KIVI Nieuwjaarsreceptie

- Afdeling Elektrotechniek
- Afdeling Energie & Warmtetechnolgie
- Regio Leiden, Den Haag

OUR ENERGY, YOUR POWER

Raymond Gunnewijk; January 2015

Who is NEM?

- **Founded in 1929, active in HRSG design since 1968**
- **Globally leading in the field of steam related equipment**
- **Business unit structure to enable specialization in specific products**
- **Head office in Zoeterwoude, the Netherlands. Other offices in the Netherlands, US, Germany, Malaysia, Dubai and Egypt**
- **Owned by Siemens AG, Business Unit Energy Solutions**

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- **Head office**
- **Zoeterwoude**

Our global presence

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Offices in 6 countries

35,000 MW installed

On 6 continents

25 business partners around the world

Over 550 passionate specialists

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NEM is a globally leading engineering company in the field of custom made steam related equipment. Due to our skilled professionals we have a lot of knowledge on our products, services and clients.

- **Specialist know-how**
- **Wide international experience**
- **Quality and reliability**
- **Innovative**
- **Tailor-made products**
- **From design to after sales**

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- **NEM intends to be internationally recognised as the preferred partner for custom-made solutions and services in the field of industrial-, utility- and heat recovery steam generators and related equipment.**
- **In order to achieve this goal, we need to discern ourselves from our competitors by continuously developing custom-made products, solutions and services which are unique or indispensable to our clients due to our know-how.**
- **Our innovative products, solutions and services are aimed at generating reliable energy in the most efficient manner, thereby taking into account our responsibility towards the environment and towards future generations.**

NEM Energy Holding B.V.

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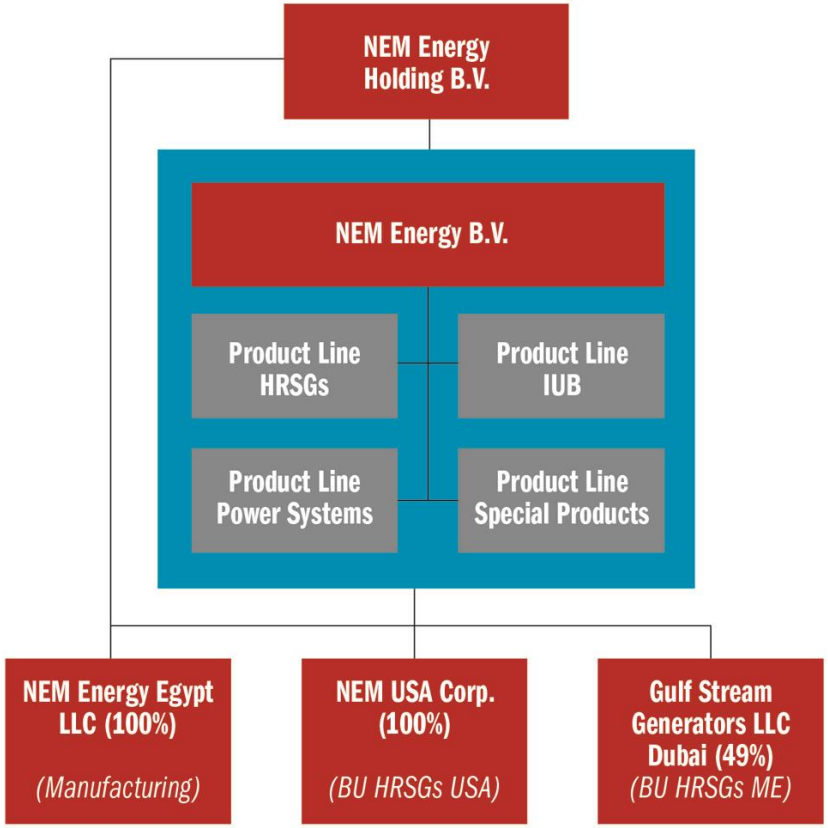

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Large HRSGs

- Vertical
- Horizontal
- Benson
- DrumPlus

Industrial & Utility Boilers

- OT-HRSG
- EDL Boilers
- Bi-drum Boilers
- CO Boilers
- Biomass Boilers
- Blast Furnace Gas Boilers
- Utility Boilers
- Geo-thermal heat-exchangers

Modular HRSG Systems

- Horizontal
- Vertical
- DrumPlus

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NEM Power-Systems

- Exhaust Gas Systems
- Diverter Dampers
- Stack Dampers
- Flap Dampers
- Blanking Plates
- Guillotine Dampers
- Louvre Dampers
- Off Shore Dampers

Special Products

- Consultancy
- Engineering
- Inspections
- Field Advisory
- Service Agreements
- Refurbishments
- Spare Parts
- Training Simulators
- Life Time Monitoring Systems

Installed base worldwide

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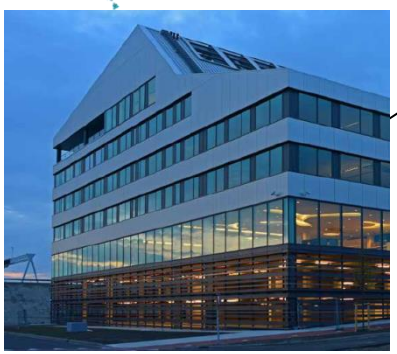

NEM Zoeterwoude Head Office

- HRSGs
- Industrial & Utility Boilers
- NEM office

Installed base the Netherlands

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- HRSGs
- Industrial & Utility Boilers
- NEM office

Installed base Europe

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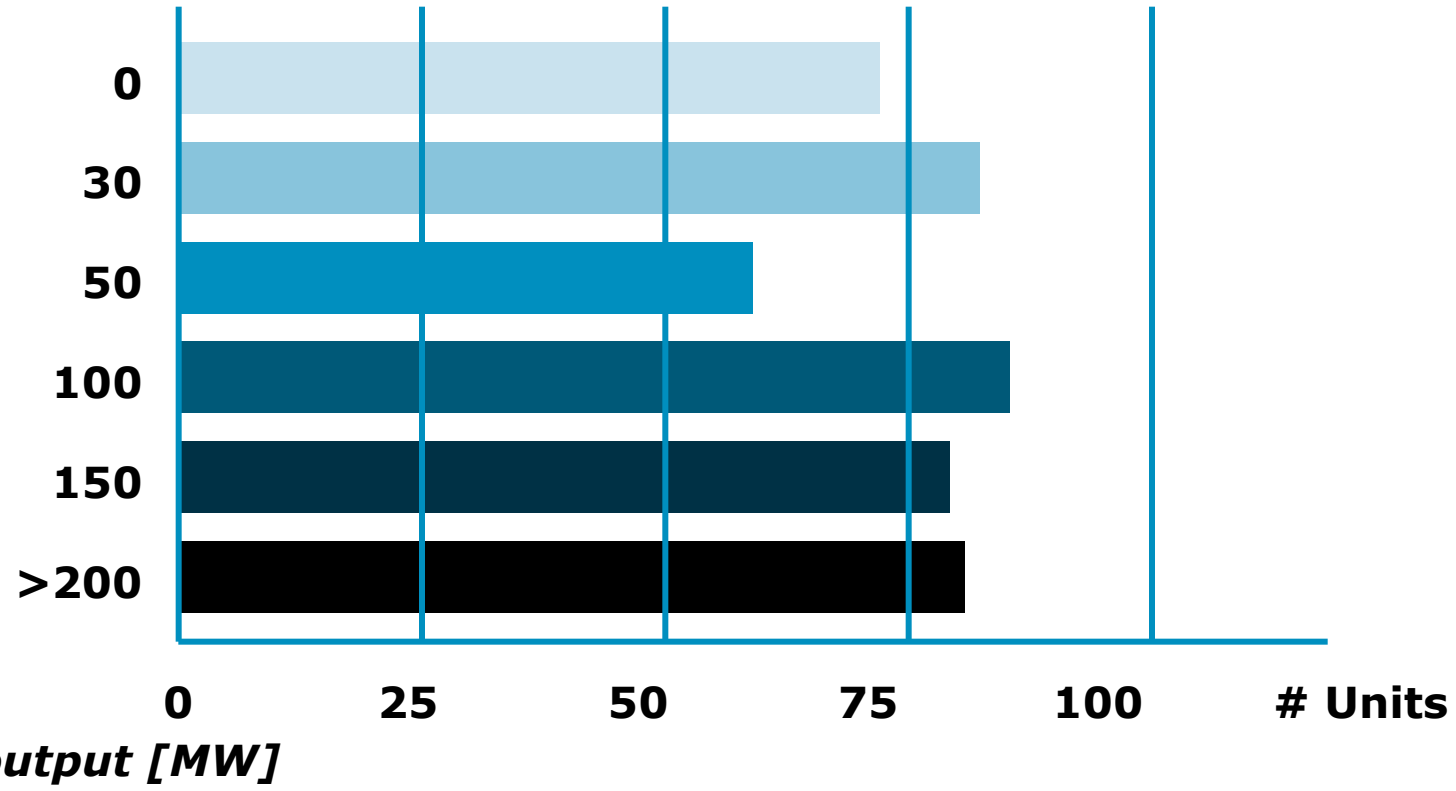
HRSG experience in all GT sizes



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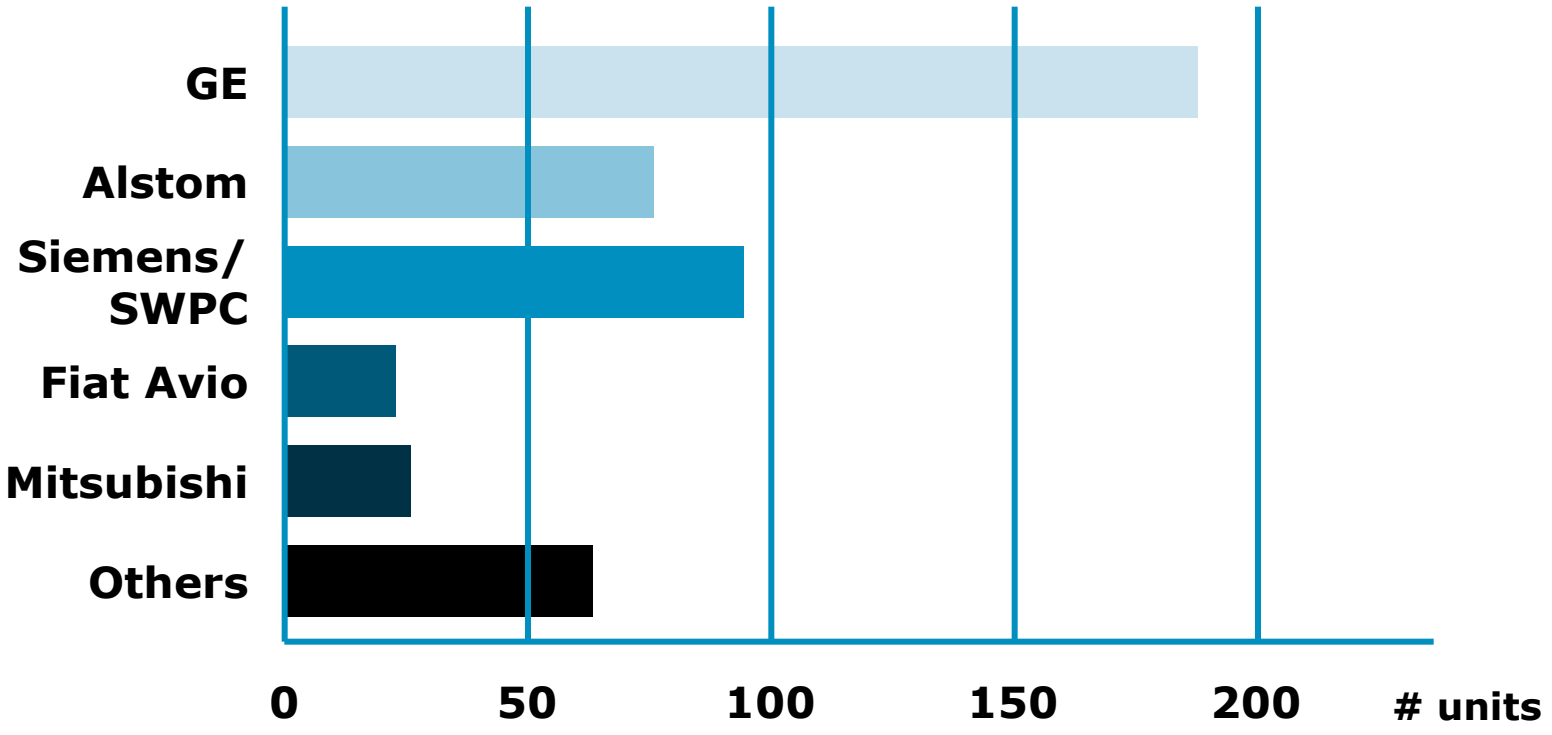
All GT manufacturers



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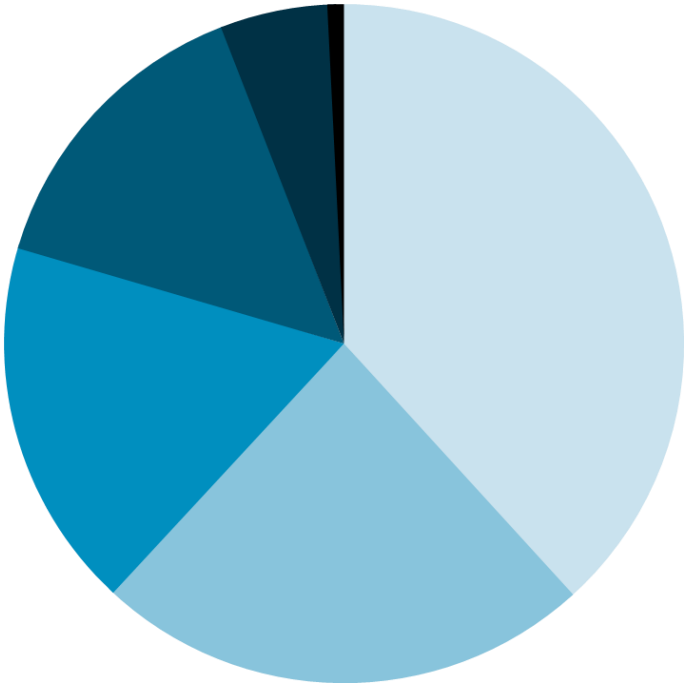
Experience in all areas

Users:	**Industrial cogeneration**	**112**
	Utilities & IPP's	**347**



Regions:

- Europe
- Middle East/Africa
- Asia/Far East
- North America
- Latin America
- Australia & Pacific

This project comprises the realization of a Natural Gas Combined Cycle Power Plant of approximately 1,300 MW. The three vertical HRSGs will be the largest ever built by NEM and are extremely complex because of their size and additional equipment.

Project: **NUON Magnum IGCC Power Plant**
Location: **Eemshaven, the Netherlands**
Owner: **NUON**
Product: **HRSGs**
Commercial operation: **2012**

Technical features

Quantity: **3**
GT: **M 701F**
Gasflow: **Vertical**
Circulation: **Natural**

Pressure levels: **3 + reheat**
HP: **312 t/hr, 120 bar, 540°C**
LP: **34 t/hr, 6 bar, 224°C**

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Project: **SAMCO**

Location: **Al Jubail, Saudi Arabia**

Owner: **SAMCO**

Product**:** **Fired Boiler Bi-drum**

Commercial operation: **2012**

Technical features:

Firing: **6 Low NOx Burners**

HP: **280 t/hr, 44 bar, 400 °C**

Fuel: **Natural Gas/Oil**

Modularization Large HRSGs

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Harp design

Bundle design

Modularized HRSG design

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Modularized HRSG design

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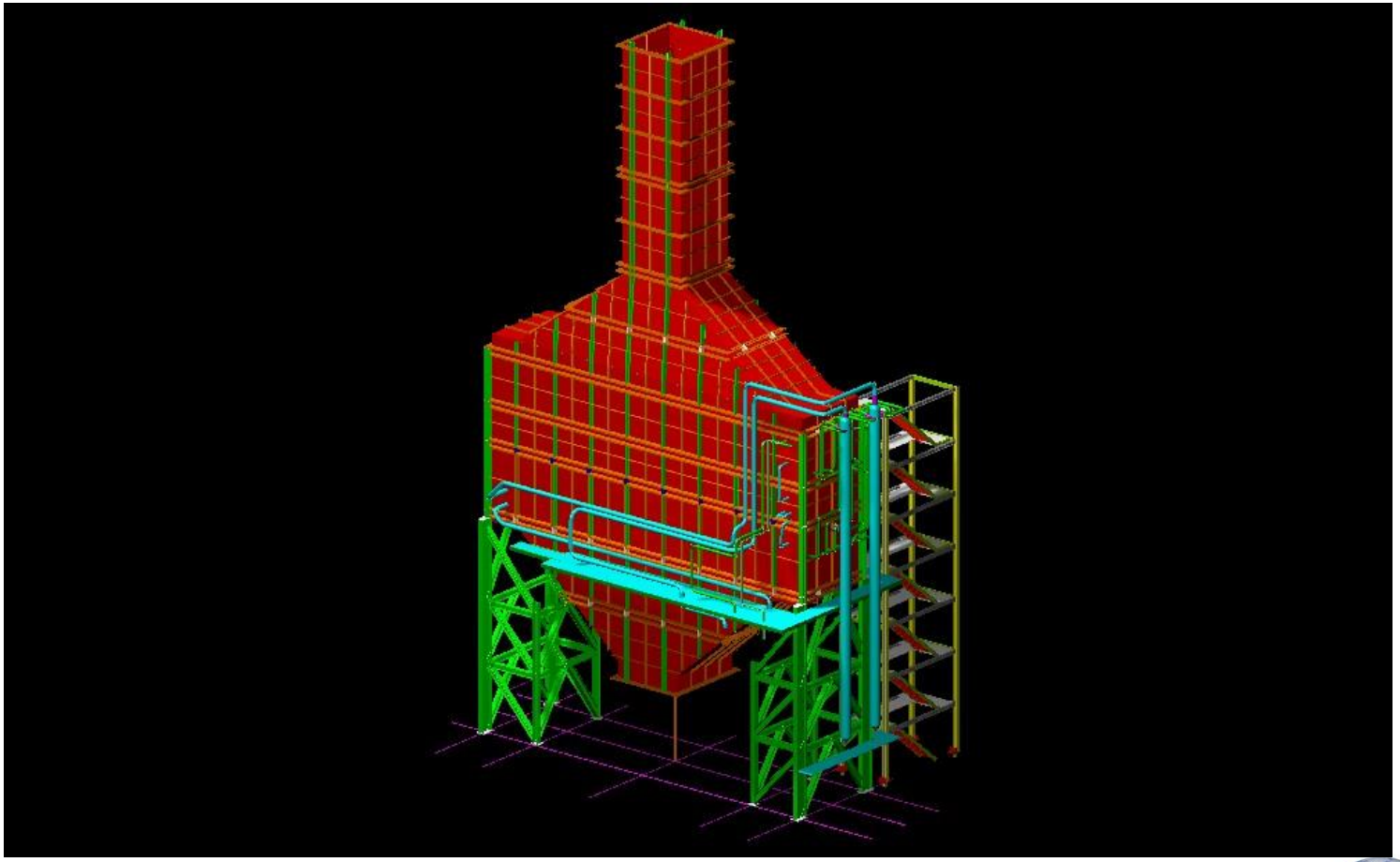
teaser-modules-1.mp4

megalopolis-teaser-2.mp4

Modular vertical HRSG

- Typical for ‘smaller’ GT (20 – 100 MW)
- Single gaspath
- Modular concept
- HP and IP in benson technology to reduce piping quantities
- Process technology developed with support from Benson team Erlangen.
- Small plot, HRSG can be located above GT.
- Short construction times (estimated 8 – 10 weeks).
- Dry running capabilities as special feature (use of alloy throughout HRSG).

Modular vertical HRSG



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NEM-VOTSG (Process + Erection).mp4

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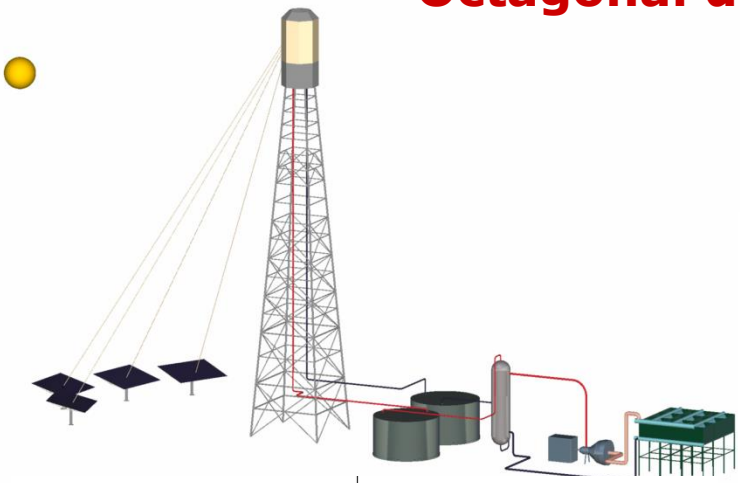
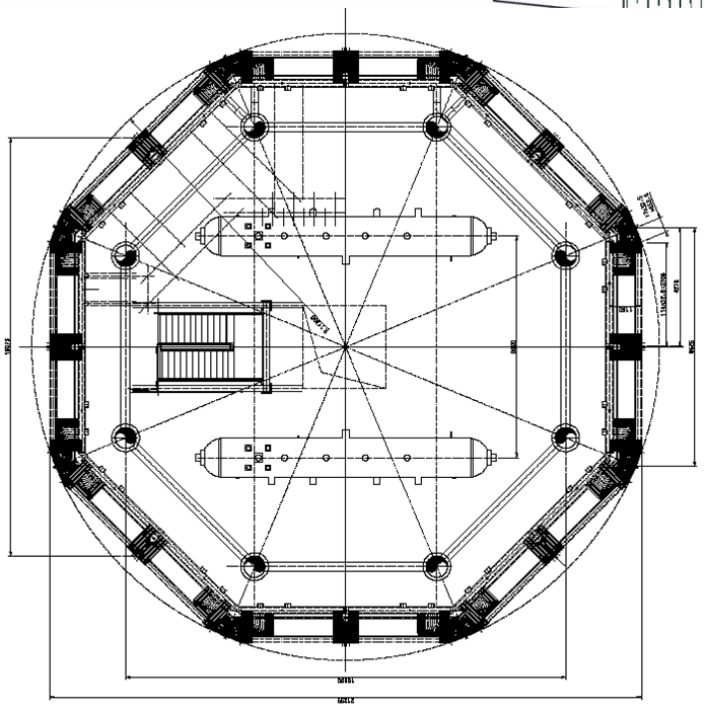
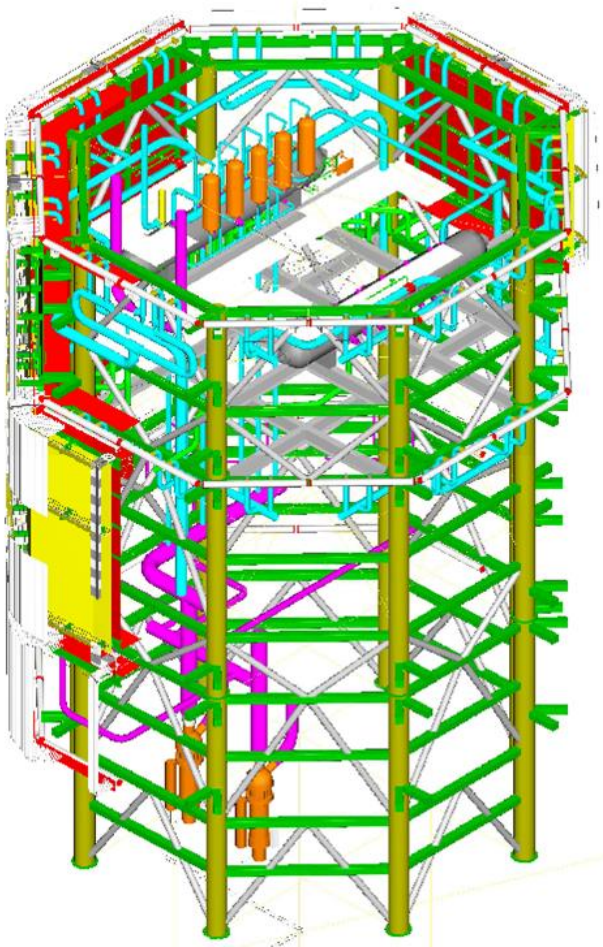
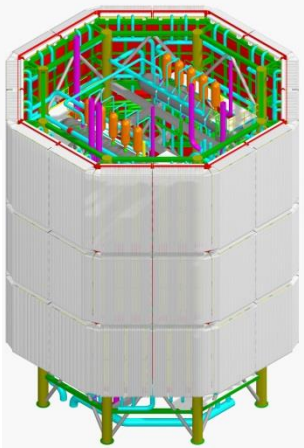
Direct steam Receiver

Octagonal design: optimum optics vs simplicity









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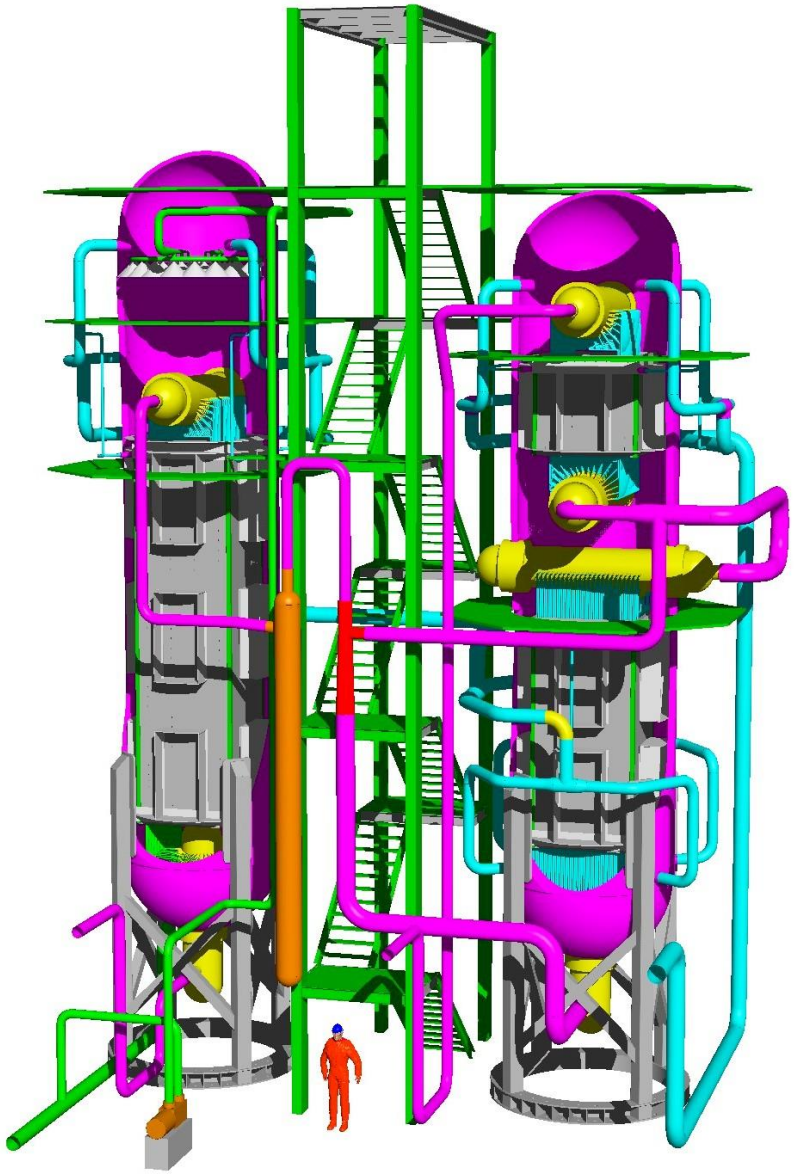
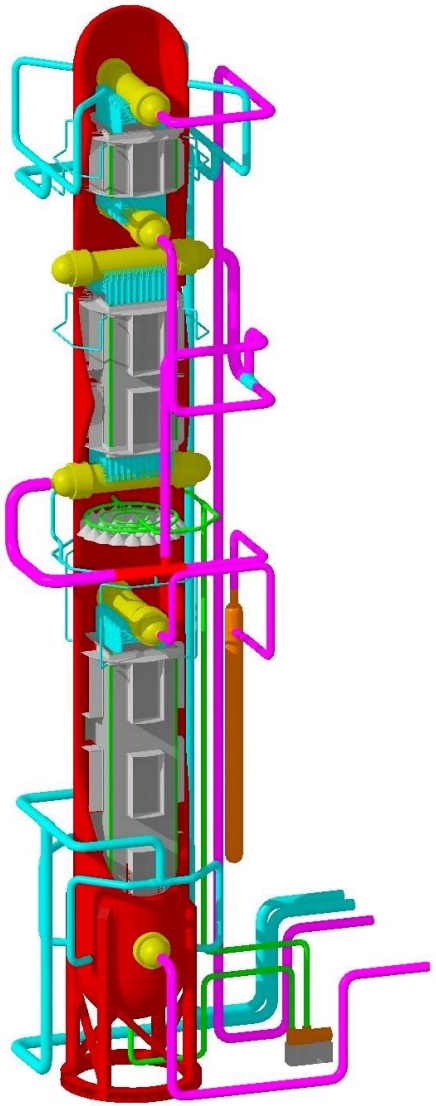
Geothermal & Organic Rankine Cycle applications





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Trends CCPP size and efficiency

Increasing size and performance of GT's (F class, H class)

H class:

- **Exhaust temperature:640 - 650 C**
- **Exhaust flow: ~ 850 kg/sec**
- **Exhaust velocities up to 200 m/sec**
- **Increased steam parameters (higher steam pressures and temperatures)**

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Operational trends

Energy mix including renewables

CCPP are required to support variations in demand

Operational flexibility

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Operational flexibility

Cycling of CCPP

- High ramp rate/fast starts
- Daily cycling
- Or even multiple starts per day (Flexplant concept, peak shaving)
- Frequent operation in part load

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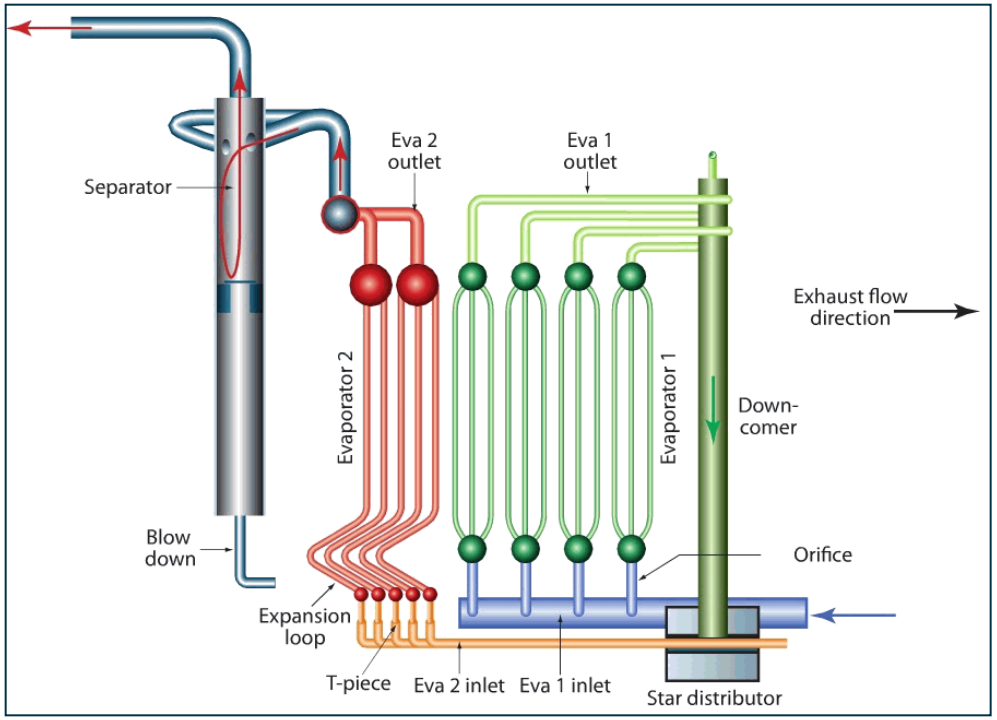
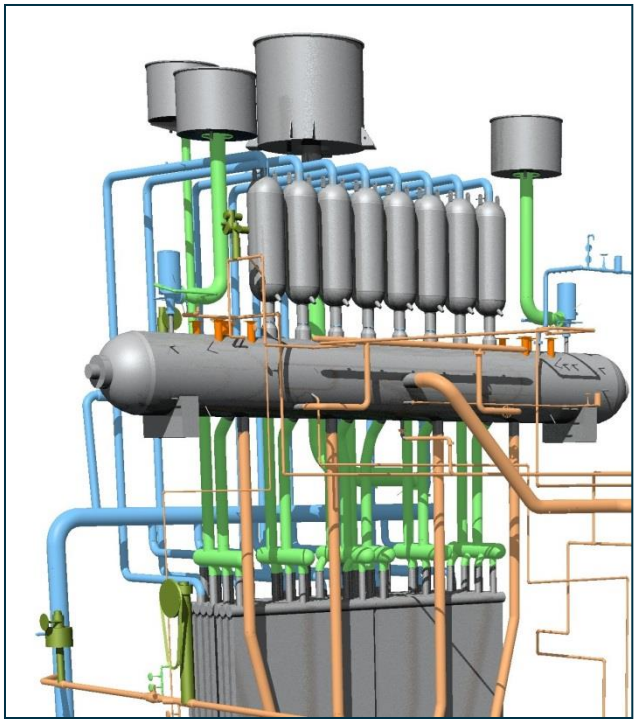
HP system lay-out

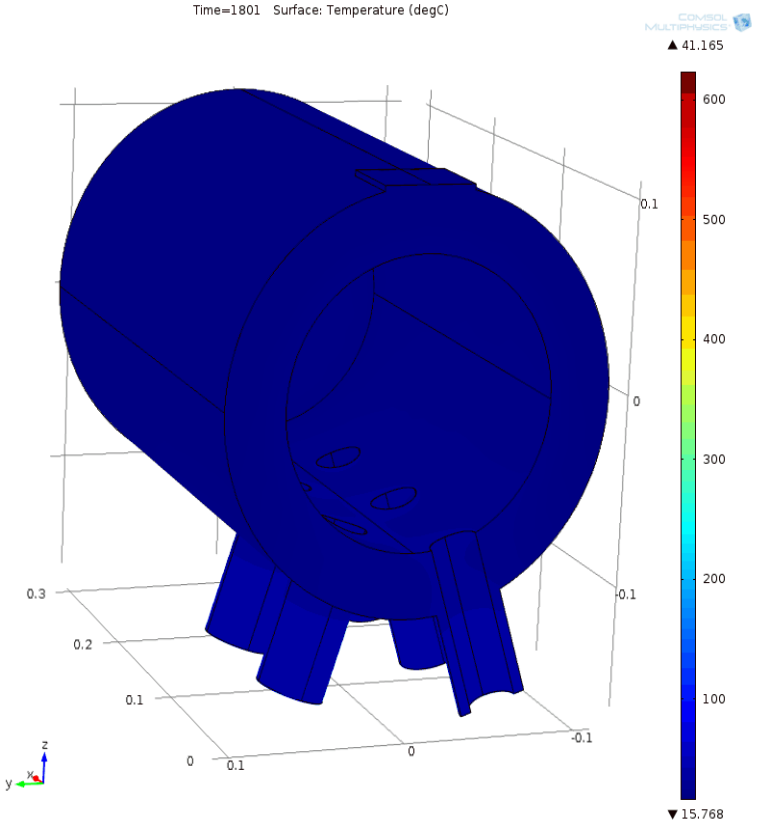




Benson™:
HP drum deleted, introduction of thin walled separator.

DRUMPLUS™: Smaller diameter drum, extra multiple separator bottles

Low cycle fatigue



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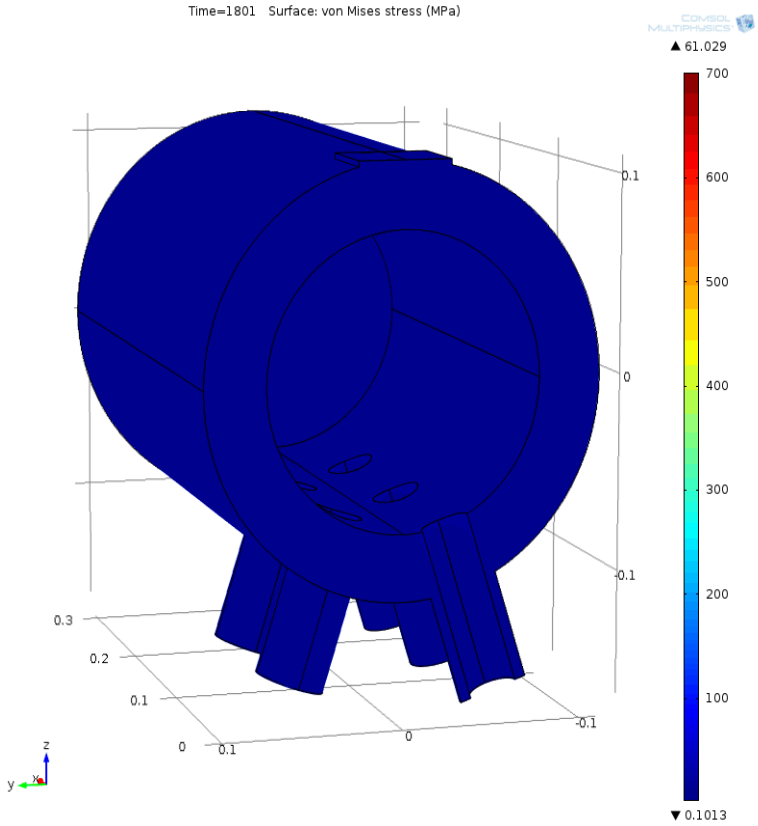

Stress

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Questions?

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In case you have any questions, please do not hesitate to ask!