# WASTE HEAT RECOVERY
# APPLIED TO THE PLASMA GAS TURBINE

**By**
**John Varney**
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With the growing evidence that climate change is exposing increasing regions of the globe to drought, there is no doubt that desalination will be a critical feature of strategies to maintain fresh water supplies to meet the demands of the farming industries, the associated communities and wildlife sanctuaries that are under threat of extinction.
The two major processes for desalination are "reverse osmosis" and "multi-stage flash" and it is the latter process that can be easily accommodated with heat recovery from the hot exhaust air of a plasma gas turbine power generating plant. This desalination process is a well proven and developed technology that, for large power generating plants with an abundance of available waste heat, can produce large quantities of high purity water [at a coastal location] and deliver via buried water mains, to the inland regions experiencing water shortages.

**The large [land based] plasma gas turbine plant.**
A 10 stage flash desalination plant would be suitable for this application, utilizing brine re-circulation for cooling through 8 stages and sea water for cooling for the last 2 stages[at the low pressure end] and also as make-up to the brine re-circulation stream. This arrangement will minimize the quantity of chemical injection required for scaling suppression.
The heat in the plasma gas turbine exhaust stream is used to generate low-pressure steam that is conveyed to the brine heater where it condenses and is pumped back to the steam generator in a closed and simple loop requiring zero make-up.
The recycled brine [leaving the condenser of the high pressure stage of the desalination plant] would normally go to the brine heater directly so that it can gain sufficient heat to return to the high-pressure stage and flash off [at cascading pressures] through all 10 stages thus forming the source of pure water. In this design however, in order to maximize heat recovery, the recycled brine leaving the condenser of the high-pressure stage, goes first to a pre-heating coil [located in the turbine exhaust stream] and then on to the brine heater.

Performance summary: considering a 1200 MW plant

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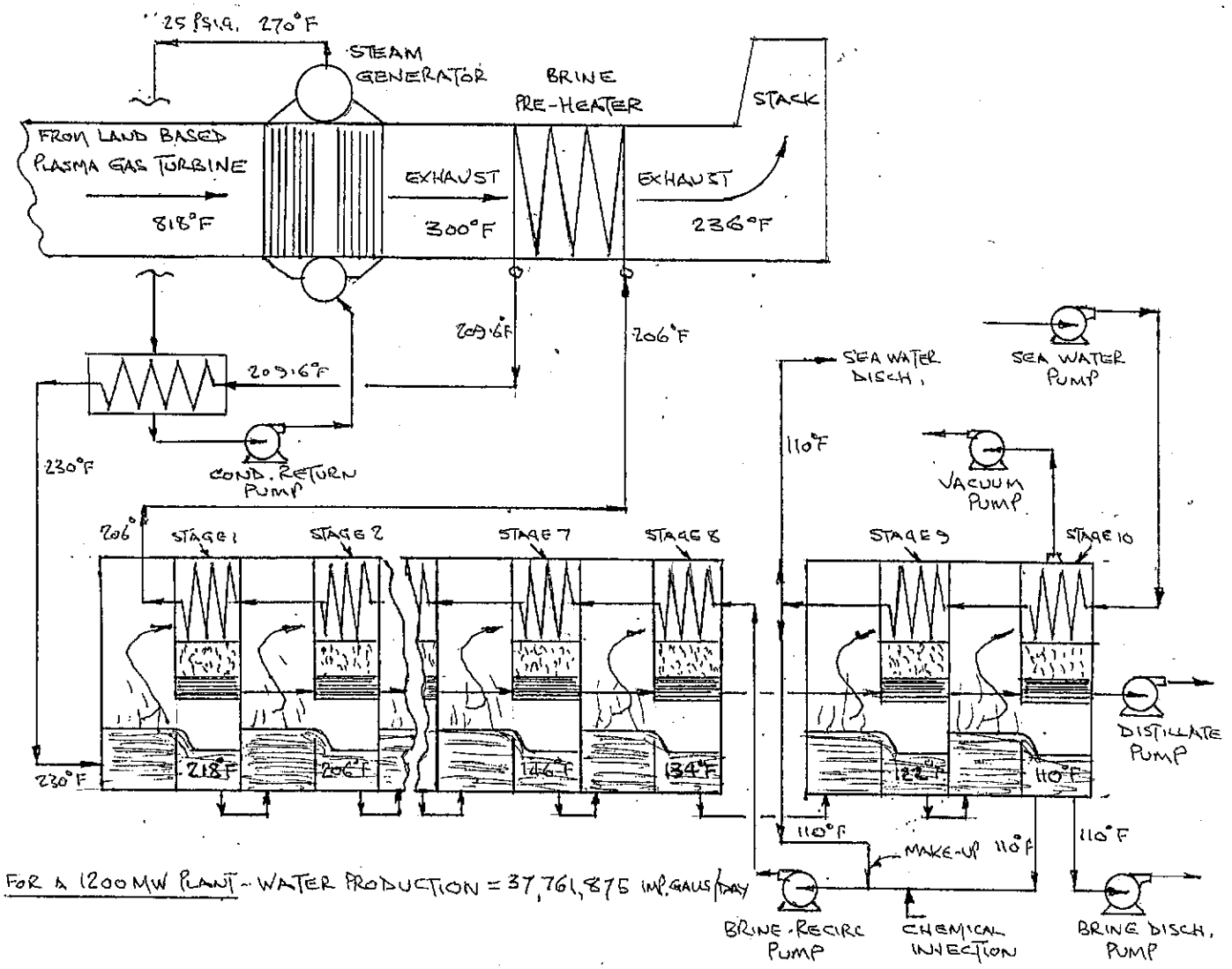
| Gas turbine exhaust flow | = 6347 lbs/sec. |
| Gas turbine exhaust temp. before steam generator | = 818 deg. F |
| Gas turbine exhaust temp. after steam generator | = 300 deg. F |
| Gas turbine exhaust temp. after brine pre-heater | = 236 deg. F |
| Brine temp. entering the brine pre-heater coil | = 206 deg. F |
| Brine temp. leaving the main brine heater | = 230 deg. F |
| Brine flow-rate [through brine heater and pre-heater] | = 38247 lbs/sec. |
| Total flash steam rate [through all 10 stages] | = 4460 lbs/sec. |
| Daily water production [allowing for 2% heat losses] | = 37,761,875 imp. gallons per day |

**THE 10 STAGE FLASH DESALINATION PLANT**

[as waste heat recovery on land based plasma gas turbine power plants]

By J Varney May 26th.2010




FOR A 1200 MW PLANT - WATER PRODUCTION = 37,761,875 IMP. GALS/DAY

**THE 4 STAGE FLASH DESALINATION PLANT**

For application to shipping

[as waste heat recovery on plasma gas turbines used for electric propulsion]

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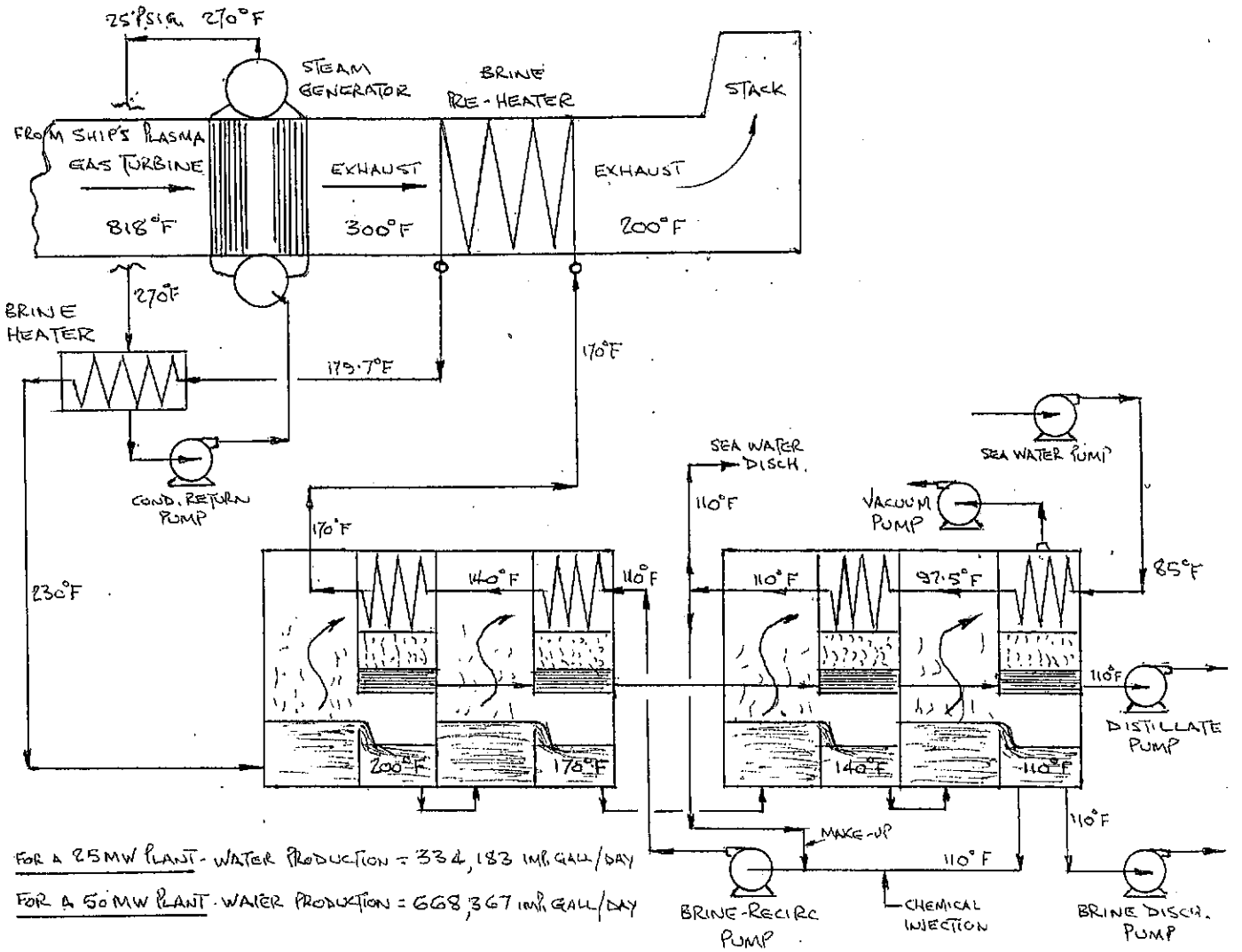


FOR A 25MW PLANT - WATER PRODUCTION = 334,183 IMP. GALL/DAY

FOR A 50MW PLANT - WATER PRODUCTION = 668,367 IMP. GALL/DAY