ORC SELECTION GUIDE

Power from waste heat – ElectraTherm, BPower and Triogen

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WHERE TO START?

An ORC (Organic Rankine Cycle) converts heat from 65–150 °C hot water or flue gas above 350 °C into electricity. The condenser heat remains available for uses such as drying or space heating. Selecting the right unit comes down to three questions: **what is the heat source, how much thermal power is available, and where does the condenser heat go**.

1. What kind of heat source is available?

Hot water / cooling water

Biomass and hot water boilers, engine jacket water, process hot water loops. 65–150 °C.

2. Is cooling the primary objective?

Yes → AC800 Active Cooler
Cools up to 800 kW while generating up to 75 kW of electricity

3. No – select by thermal input:

PM75 · 600–1,600 kW heat · 65–132 °C
→ up to 75 kW electricity

PM150 · 800–2,200 kW heat · 70–150 °C
→ up to 125 kW electricity (50 Hz)

PM375 in development · up to 4,000 kW · 65–150 °C
→ up to 375 kW electricity

Flue / exhaust gas ≥ 350 °C

Gas and biogas engine exhaust, boiler and furnace flue gas, hot air.

Select by heat transferred to the ORC:

Triogen e-box 50 · 480 kW
→ 50 kW electricity

Triogen e-box 100 · 690 kW
→ 100 kW electricity

Triogen e-box 180 · 990 kW
→ 180 kW electricity

Flex setup: separate evaporator where space or height is limited. Max. back pressure on engine < 25 mbar.

Other sources

Flue gas below 350 °C, steam, thermal oil, media other than water/glycol.

Interface heat exchanger + hot water loop
→ ElectraTherm model by thermal input (left column)

Note: Flue gas must not be cooled below its dew point – acidic condensate rapidly corrodes the heat exchanger and piping.

Note: With water below 70 °C, an ORC is usually not economical – a heat pump or MVR is then evaluated instead.

Gas and biogas engines: an engine provides both jacket water and exhaust gas. These can be used separately (jacket water → ElectraTherm, exhaust → Triogen) or combined into one hot water loop, which raises the ElectraTherm inlet temperature. The ORC also takes load off the engine radiator, reducing the electricity used by its fans.

RULES OF THUMB

1. **Available heat matters most.** Water as low as 70 °C can be used, but sources above 100 °C are ideal. Besides temperature, output depends on flow rate and the hot/cold water temperature difference.
2. **Electrical yield is approx. 5-9 % in hot water applications** and up to 18.2 % in flue gas applications (Triogen). The figure is indicative – see the table on page 2.
3. **Condensing temperature is a trade-off.** The hotter the condenser heat is used (e.g. for district heating), the less electricity is produced. Example: the e-box 180 Power produces 180 kW with 55 °C coolant outlet, but approx. 135 kW at 80 °C. The CHP version produces approx. 150 kW at 80 °C.
4. **Running hours and power price drive payback.** Target approx. 80 % uptime (~7,000 h/yr). Payback is fastest when the electricity is consumed on site.

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This guide is indicative and does not constitute a binding offer. Final sizing is always based on site-specific data.

MODELS AT A GLANCE

Model	Heat source	Source temperature	Thermal input	Electrical output (50 Hz)	Electrical yield*	Working fluid	Dimensions W × L × H / weight	Status
ElectraTherm / BPower (BITZER Group) – hot water ORC, twin-screw expander								
PM75	Hot water / glycol	65–132 °C	600–1,600 kW	75 kW	~4.7 %	R1233zd(E)	1.8 × 2.4 × 2.2 m 2,590 kg	Series product
PM150	Hot water / glycol	70–150 °C	800–2,200 kW	125 kW	~5.7 %	R1233zd(E)	2.0 × 3.3 × 2.5 m 4,650 kg	Series product
PM375	Hot water / glycol	65–150 °C	up to 4,000 kW	375 kW	~9.4 %	R1233zd(E), R600	~6 × 2.3 × 2.5 m**	In development
AC800	Engine jacket water – cooling is primary	above 71 °C	cooling up to 800 kW	75 kW	–	–	2.3 × 10.1 × 2.0 m 6,500 kg	Series product
Triogen – flue gas ORC, radial turbine								
e-box 50	Flue / exhaust gas, hot air	min. 350 °C (outlet 160–220 °C)	480 kW	50 kW	~10.4 %	Toluene	e-box 2.44 × 6.06 × 2.59 m, ~10,000 kg + evaporator 3,000–7,000 kg	Series product
e-box 100			690 kW	100 kW	~14.5 %			
e-box 180			990 kW	180 kW	18.2 %			

* Calculated: max. electrical output / max. thermal input. Indicative only and not a manufacturer-stated efficiency – except Triogen's 18.2 %, which is the manufacturer's stated maximum. Actual output depends on temperatures, flow rate and heat rejection.
** Preliminary estimate, excluding dry cooler. Thermal input for Triogen = heat transferred to the ORC.
ElectraTherm: cold water inlet max. 45 K below hot water inlet. Triogen: cooling water 40/55 °C … 75/90 °C.

INFORMATION NEEDED FOR A QUOTATION

With the following data we prepare a preliminary sizing and yield estimate:

- ☐ **Heat source and medium** (water, glycol, flue gas, steam, thermal oil)
- ☐ **Temperatures**: supply and return, flue gas before and after
- ☐ **Flow rate or thermal power** and their variation (summer/winter, part load)
- ☐ **Operating hours** per year and load profile
- ☐ **Use of condenser heat**: drying, space or process heating, district heating – or dry cooler?
- ☐ **Flue gas composition**: sulphur, dust, dew point and allowable back pressure
- ☐ **Grid connection**: voltage, connection capacity, grid operator; own use or export
- ☐ **Electricity price** and available energy subsidies
- ☐ **Location**: indoor or outdoor, available space and height, lifting
- ☐ **Engine applications**: engine make and model, heat balance

TYPICAL APPLICATIONS

Biomass heating plants and sawmills
Boiler heat to electricity, condenser heat to timber kilns.
PM75 / PM150 / PM375

Biogas and gas engines
Wastewater treatment plants, biogas plants, landfills.
AC800 / PM series / e-box

Industrial processes
Flue gas from furnaces, dryers and thermal oxidisers, and process hot water loops.
e-box / PM series

Summer surplus heat
When heat demand is low, boiler heat is turned into electricity – extending operating hours.
PM series

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