



BELLETTI e FERRARI S.r.l. Process plants  
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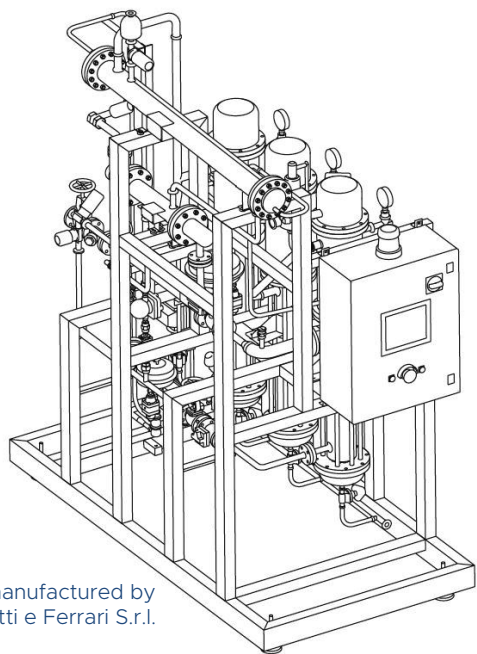
**BELLETTI e FERRARI** SRL

# MES

## Multi Effect Still

Manufacturing and design standard

- European Pressure Equipment Directive 97/23/EC
- ASME - Section VIII Div I
- Optional FDA 21 CFR Part 11 compliance
- GAMP
- cGMP
- ASME BPE



Designed and manufactured by Belletti e Ferrari S.r.l.

MES multi-effect stills

Belletti e Ferrari’s range of multi-effect stills are designed for use within the biopharmaceutical industry and to meet all the requisites that this industry demands. With almost 50 years of experience in clean fluids technology, we have the knowledge and expertise to optimize the design of our MES to consistently provide you with pyrogen free pharmaceutical grade Water For Injection.

Belletti e Ferrari’s MES will satisfy the requirements of International Pharmacopeia standards, whilst offering you exceptionally low cost of ownership and guaranteed performance.

- Optimised plant steam control and ancillaries
- First effect PID level control for safe consistent performance
- cGMP design and regulatory compliance
- Unique optimised multi-tube downcomer
- cGMP double tube sheet heat exchanger on first effect
- Capacity range from 100 kg / h

MES operating principles

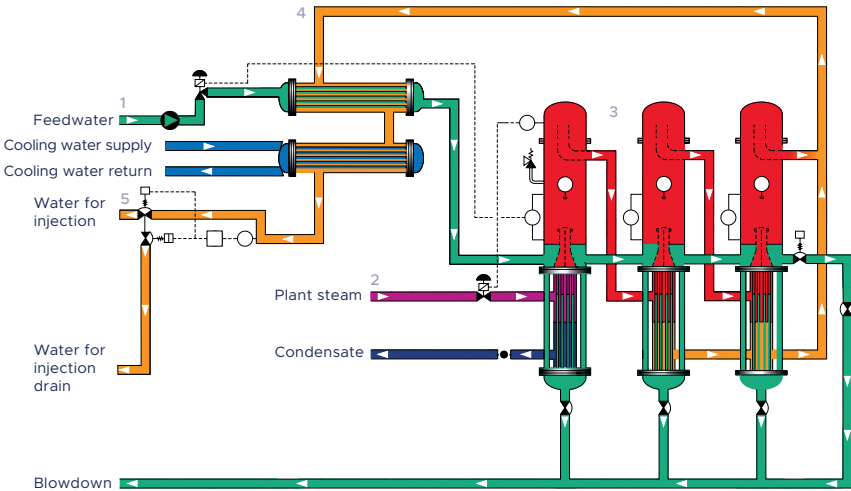
The Belletti e Ferrari’s MES employs the multi-effect distillation principle.

- Feedwater is supplied to the first effect column via the distillate cooler and pre-heater double tube sheet heat exchangers.
- Plant steam is applied to the first effect evaporation column where the feedwater is vaporized and pure steam produced.
- Pure steam produced inside the first effect is applied to the following effects to preheat and produce pure steam. The condensed pure steam forms the WFI product.
- Pure steam produced in the final effect is condensed by passing through the feedwater preheater and final cooling heat exchanger.
- Distillate / WFI is released at the outlet.

MES options

To supplement our standard MES we offer pre-engineered options, ensuring a solution specifically optimised for your process.

For a complete list of available options contact your local Belletti e Ferrari S.r.l. High Purity representative.



MES range at a glance

Production and consumption

When the available steam pressure = 7 bar g

**Please note** - Higher capacities and additional effects to further enhance your life cycle costs are available on request, please contact your Belletti e Ferrari high purity specialist who will be pleased to discuss your requirements.

Model	Number of effects	WFI actual production (kg / h)	Plant steam consumption (kg / h)
MES100/3	3	126	52
MES200/3	3	230	95
MES400/3	3	390	161
MES600/4	4	593	195
MES1000/4	4	1022	336
MES1500/4	4	1525	505
MES2000/4	4	2015	673
MES3000/4	4	3094	1009
MES5000/4	4	5300	1680

Optimised design

- Evaporation chamber dimensions optimised for enhanced separation eliminating carryover.
- Through the employment of specific software calculations your individual requirements are used to ensure the optimal number of effects with increased energy efficiency.
- First effect PID level control guarantees system efficiency and operation consistency throughout the operating range of the unit.
- Unique column design with external multi-tube configuration maximises heat transfer, increasing the performance and energy efficiency of the unit.
- Three distinct and optimised separation techniques guarantee the consistent production of pyrogen free pharmaceutical grade Water for Injection.



Key features and benefits

Key features	Key benefit
Distillate / WFI production	Consistently provides pyrogen free pharmaceutical grade Water For Injection. Produced WFI complies, as a minimum, with USP, EP, JP and other international Pharmacopeia standards.
Compliant to all International Pharmacopeia and Standards	The MES complies with: US, European and Japanese Pharmacopeia, FDA, ASME BPE and ISPE Baseline Guides.
Effects selection based on energy efficiency	Dedicated software to calculate optimised number of effects for maximised plant steam efficiency.
PID level control	Unique sanitary PID level control guarantees consistent system efficiency and performance.

Complete validation documentation

- Wholly recorded Factory Acceptance Test.
- Fulfilment of the site acceptance test to give the best contribution to the starting and qualification activities.
- Complete Protocol of Qualification of the Installation (IQ) and Operative (OQ).
- High purity group with wide knowledge and understanding of the water injection application (WFI).
- We ensure you that water injection (WFI) will be ready for your every moment.