Condensate Iron Removal Filter Elements for Combined Cycle Plant

1. PERFORMANCE REQUIREMENTS (MANDATORY)

Parameter	Requirement	Test Standard
Iron Concentration Downstream	≤ 5 µg/kg (5 ppb) maximum	ASTM D1068 or equivalent
Absolute Filtration Rating	5 µm or finer (β_{1000} @ rated micron)	ASTM F795-88
Filtration Efficiency	≥ 99.9% absolute at rated micron	ISO 16889
Maximum Pressure Drop (Clean)	≤ 0.15 bar @ design flow	-
Maximum Pressure Drop (Dirty)	≤ 2 bar @ design flow (See note 1)	-
Beta Ratio	≥ 1000 (β_{1000}) at 5 µm	ASTM F795-88
Burst Pressure	≥ 10 bar minimum	ASTM D2724
Minimum DHC or guaranteed runtime	minimum retained capacity ≥12 kg (ISO MTD, multi-pass) per 60" element" or "minimum service life ≥8,000 hours at design flow under normal contaminant levels.	ISO 16889

Note 1: This value provides a sufficient safety margin below the system's bypass activation pressure (2.5 bar)

2. OPERATING CONDITIONS (DESIGN BASIS)

Parameter	Normal Operation	Startup/Upset Conditions
Fluid Medium	Demineralized condensate	Condensate with corrosion products
Flow Rate	219,564 - 324,432 kg/h	Variable during startup
Operating Pressure	17.06 - 19.25 barg	Up to design pressure
Operating Temperature	33.5°C - 64.8°C	Transient variations
Design Pressure	21.7 barg	-
Design Temperature	79.8°C	-
pH Range	8.5 - 9.5 (ammonia dosed)	pH variations during startup

Note: The total system flow is handled by a single filter vessel containing **19 filter elements**, which operate in parallel. Vendor submissions must consider this configuration for all performance calculations.

3. MATERIALS AND CONSTRUCTION (MANDATORY)

Component	Material Requirement	Standard/Grade
Filter Media	Polypropylene microfiber or equivalent high-efficiency media	FDA-compliant materials
End Caps	Polypropylene, glass-filled nylon, or 316L SS	Chemical resistant
Core/Support	Polypropylene, HDPE, or 316L SS perforated	Structural integrity
Sealing Elements	EPR O-rings (see note 2)	Temperature/chemical resistant
Overall Construction	Thermal bonding or ultrasonic welding (no adhesives)	Leachable-free construction

Note 2: EPR (EPDM) O-rings are specifically required for compatibility with ammonia-dosed condensate (pH 8.5-9.5).

4. DIMENSIONAL AND INSTALLATION REQUIREMENTS

Parameter	Requirement
Outside Diameter	6.0" (152.4mm)
Inside Diameter	3.0" (76.2mm)
Length	60" (1524mm) to suit existing housing
End Configuration	Single open end
Sealing Method	EPR O-ring seal (3" NB)
Flow Direction	Inside to Outside
Compatibility	Elements must be designed for drop-in installation into a single housing configured for **19 elements**.

5. WATER QUALITY COMPATIBILITY: Filter elements must be fully compatible with condensate exhibiting the following characteristics:

Normal Operation Condensate:

Parameter	Requirement
Iron (Fe)	< 20 µg/kg
Copper (Cu)	< 3 µg/kg
Silica (SiO_2)	< 20 µg/kg
Sodium (Na)	< 10 µg/kg
Total Dissolved Solids (TDS)	< 1 mg/L
Conductivity	< 0.2 µS/cm
Total Organic Carbon (TOC)	< 50 µg/kg
Chloride (Cl)	< 5 µg/kg
pH	8.5 - 9.5 (ammonia dosed)

Startup Condensate (Design Worst-Case):

Parameter	Requirement
Iron (Fe)	**Up to 1000 µg/kg (temporary spikes)**
Suspended solids	**Up to 50 mg/L**
Conductivity	**Up to 5 µS/cm**

Note: Confirm if the filter elements, when operating with the specified inlet condensate characteristics (including Fe < 20 ppb), are capable of consistently meeting the required discharge standard of Iron.

6. TERMS OF TECHNICAL SUBMISSIONS

For the offered filter element model, the vendor shall provide the following certified technical data and documentation:

A. **PERFORMANCE SPECIFICATIONS**

- **Beta Ratio:** Certified test results showing $\beta_{1000} \geq 1000$ at 5 µm per ASTM F795-88.
- **Iron Removal Efficiency:** Test certificates confirming the ability to achieve a downstream iron concentration of ≤ 5 µg/kg, tested according to ASTM D1068.
- **Filtration Efficiency:** Documentation showing ≥99.9% absolute efficiency at the rated micron per ISO 16889,

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including data on dirt-holding capacity under simulated condensate conditions.

- **Burst Pressure:** The certified burst pressure rating, which must be ≥10 bar per ASTM D2724.
- **Clean Pressure Drop:** A certified value confirming a pressure drop of ≤0.15 bar at the design flow rate per element (approx. 11,556-17,070 kg/h, calculated for a 19-element housing).
- **Dirty Pressure Drop:** A certified value confirming a pressure drop of ≤2 bar at the design flow rate per element.
- **Pressure Drop Curves:** Graphs showing the relationship between flow rate and pressure drop for both clean and dirty conditions.
- **System Flow Rate:** Confirmation that the offered elements, when configured in a 19-element housing, can support the total system flow rate of up to 324,432 kg/h.

B. Construction Method:

- Confirmation that the filter construction uses thermal bonding or ultrasonic welding with no adhesives, ensuring a leachable-free design.
- Material certificates for all FDA-compliant components (media, end caps, core).
- Detailed drawings.

C. **COMPLIANCE CONFIRMATION**

Water Quality Compatibility: The vendor shall provide a detailed declaration confirming the filter's compatibility with the following water qualities:

- **Normal Condensate:** Fe <10 µg/kg, Cu <2 µg/kg, SiO_2 <20 µg/kg, TDS <1 mg/L.
- **Startup Condensate:** Fe up to 1000 µg/kg, suspended solids up to 50 mg/L.
- **pH Range:** 8.5-9.5 (ammonia dosed) with startup variations.

Operating Conditions Verification: The vendor shall certify that the offered filter elements are designed to operate safely and effectively under the following conditions:

- **Operating Pressure:** 17.06 - 19.25 barg.
- **Operating Temperature:** 33.5°C - 64.8°C.
- **Design Pressure Rating:** Minimum 21.7 barg.

D. **REFERENCES**: The vendor shall provide a list of at least three (3) reference sites with similar applications in power plants, specifically for condensate iron removal, including contact information.

E. **QUALITY ASSURANCE**

Provide quality control procedures and lot-to-lot consistency documentation.
Confirm minimum 2-year shelf life from delivery.
Provide storage recommendations and environmental limits.

Quantity : 38

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