

	CLEANING PROCEDURES FOR FALLING-FILM EVAPORATORS (FFE) IN CANE SUGAR FACTORIES		
	MECHANICAL		CHEMICAL
	High pressure water-jet system	Rädler-Tube-Cleaning (RTC)	
Procedure	- deposits are removed by using high-pressure cleaning with the aid of water. - cleaning lance is guided manually, with or without machine guidance. - high-pressure pump is permanently installed at 0 m.	- deposits are ground down with a drill milling head corresponding to the inner diameter of the heating tube and removed using water cooling. - drill milling head is adapted to the heating tube and will be manually operated with an electrical control unit. - feed rate of the drill milling head is adjustable and will be monitored by a manometer. - drill milling head is guided manually within the machine guide. - machine guide is mobile, can be mounted on the tube sheet	- deposits are removed by using acids and/or lyes at temperatures in the range of 60°C to 80°C. - inhibitor must be added to prevent corrosion of the evaporator material. - in between, the FFE must be rinsed repeatedly with hot water. - chemicals must be pumped from containers into the FFE. For this purpose, they are often added on the suction side of the circulation pump.
Consumption of water and chemicals	approx. 40 L/min, depending on supplier → approx. 76 m³ at 1900 tubes (corresponding to: 2000 m²/ 8 m)	max. 9 L/min → approx. 17 m³ at 1900 tubes (corresponding to: 2000 m²/ 8 m)	- min. 20 m³ water for the acid solution (5 %) / FFE - min. 20 m³ water for the caustic solution (6 %) / FFE → approx. 40 m³ / FFE
Operating pressure	up to 1000 bar, depending on supplier	max. 8 bar	none that is in direct contact with a person
Duration of cleaning	approx. 1 min / tube, depending on degree of incrustation → approx. 1 day for 1900 tubes / high pressure water-jet system	approx. 1-1,5 minute(s) / 10 m tube, depending on degree of incrustation' → approx. 1,5 - 2 days for 1900 tubes / RTC-device → max. 4 devices can work at the same time, depending on the available space	approx. 20 h / FFE → max. 1 day / FFE