

Comparisons between AC & DC SAF

No.	ITEM	CONTENT	SAF		FEATURES	REMARKS
			AC	DC		
1	Power supply	Specialty	3 phase AC	single pole DC	DC power have flicker and skin effect, AC power need no special power supply	
		Influences to power grid	low power factor, big harmonics influences	high power factor, small harmonics influences	DC power have fewer reactive power, low harmonics can be eliminated by pulse number, AC power have more reactive power, harmonics cannot eliminated	
2	Mechanical structure	Electrode	3pcs	1pcs	DC furnace needs only 1 electrode	
		Bottom electrode	no	yes	DC furnace needs more maintenance for bottom electrode	
		Conductor	Three phase concentration	Polarization	DC furnace conductor consists of upper anode and down cathode, connected to electrode and bottom electrode, with polarizations	
		Transformer	SAF transformer	Special rectifier transformer		
		Special power supply	no	yes	DC furnace needs rectifier power supply	
3	Arc characteristics	Directional	no	yes	DC arc occurs directionally between the bottom electrode and cathode electrode; AC arc is occurs in disorder between three phase electrodes	
		Arc length	long	longer	DC arc is longer than AC under the same arc voltage	

		Deflection arc	no	yes	Deflection arc occurs on DC furnace, and needs to be solved by arc rectification	
4	Furnace performance	Thermal characteristics	More heat in arc region	More heat in furnace bottom	Bottom of DC furnace is heated at first, with good heat melting conditions; high temperature in AC furnace arc zone may lead to supercooled dead zone	
		Melting	quick	quicker	DC furnace is beneficial for melting due to its long arc; Ac furnace needs higher voltage gear for melting	
		Slagging	easier	easy	Longer arc of DC furnace needs foam slag for heat storage during smelting	
		Stir	no	yes	DC furnace has electromagnetic driving force on molten liquid and bring stirring effect	
5	Index	Power factor	DC furnace is above 0.91, AC is about 0.87; power factor of DC furnace increases with the pulse number of power supply			
		Thermal effect	DC power supply quality is better and energy utilization rate is higher than AC furnace, showing that DC furnace thermal efficiency is higher also			
		Power consumption	Power factor of DC furnace is higher, DC efficiency is higher than AC furnace; DC power consumption of the same furnace type is lower than that of AC furnace			
		Electrode consumption	There is only one electrode in DC furnace and three in AC furnace; consumption of DC electrode is about 1 / 3 of AC in same furnace type			

		Lining consumption	DC furnace has high input power and high arc energy, but its arc is concentrated in orientation, so the consumption of furnace lining is slightly higher than that of AC furnace	
6	Costs	One-off investment	Investment cost of once through furnace is higher than that of AC furnace	

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