

GMM Pfaudler Systems

Our capabilities are not limited to the individual technologies themselves. Utilizing vast chemical processing expertise, our skilled engineers combine Technologies with all other required ancillary equipment, piping, instrumentation and controls into complete, fully integrated and efficiently operating process systems.

GMM Pfaudler supplies turn-key systems from lab scale systems through full industrial scale plants, for all chemical processes. The layout is custom designed for proper system functionality and also to ensure that all equipment, instruments and valves are arranged for ease of operation and maintenance.

This single source responsibility ensures that the design of every component is integrated into a complete system design that provides optimum system performance, reduced costs, shorter schedules and high quality construction. **PROCESS SYSTEMS PACKAGES**

Engineering & Design

Reaction Systems

Evaporation & Distillation Systems

Acid Recovery

Filtration & Drying Systems

Absorption Systems

Extraction Systems

Membrane Separation Systems



Wiped Film Evaporator (WFE)

The solution for difficult evaporation and separation processes

Evaporation is used in chemical processing to separate stream components by their difference in volatility. This evaporation is difficult in processes where the streams have high viscosities, are thermally sensitive, easily foul or have high boiling points. Pfaudler developed its Wiped Film Evaporator (WFE) technology in the early 1950's to accomplish these difficult separation processes. GMM Pfaudler merged its WFE technology into its Equilloy brand of alloy process equipment in 2022. Over the years, our WFE has been installed globally in hundreds of applications in the petroleum, specialty chemical, renewable energy, agricultural, nutraceutical, pharmaceutical and food industries. The quality, durability and performance of our Wiped Film Evaporator ensures our customers of reliable, profitable and safe operation.

Process technology

The Wiped Film Evaporator (WFE) is designed to continuously separate compounds based on their volatilities. The features of our WFE accomplish difficult separations where the process streams are viscous, heat sensitive, fouling or have high boiling temperatures. The wiper blades spread the material to a thin film on the inner vessel heated wall which promotes heat transfer, especially for viscous fluids. The wiper blades continuously wipe the heated wall, effectively cleaning the heat transfer surface, which is ideal for fouling applications. Our special designed wiper blades pump the process fluid down the heated wall, so that the time the material is at elevated temperature is measured in seconds, minimizing thermal degradation. The WFE can operate at deep vacuum, which is ideal for high boiling compounds and for heat sensitive products. Our uniquely designed rotors prevent entrainment with minimal pressure drop, resulting in higher purities and improved yields. The short path design (proximity of the condenser to the heated wall) provides improved separations and minimizes pressure drop effectively reducing the operating pressure at the heat transfer surface.

Superior technology features

Our Wiped Film Evaporator has many wellproven mechanical features that ensure years of reliable service including:

- Many variations of entrainment separator designs for different types of processes.
- Large internal condensers for deep vacuum (short path) operation.
- Robust overhung rotor design (no bottom bearing required)
- Low motor horsepower requirement.
- Easy rotor removal and assembly for inspection and/or cleaning.
- Low maintenance
- · Low rotational speeds for extended seal life
- High heat transfer rates



Wiped Film Evaporator (WFE)

Wide range of design capabilities

We design and manufacture Wiped Film Evaporators in a wide range of sizes, in several different configurations, and with many materials of construction allowing the Wiped Film Evaporator to be utilized in a wide range of applications and capacities.

Materials of Construction: carbon steel; stainless steels (304SS, 316SS, 317SS, 254SMO, AL6XN); high nickel alloys (B3, C276, C22); borosilicate glass; Glasteel[®].

Size Range: 0.6-3.0 sqft (0.06-0.3sqm) borosilicate glass construction; 1.2-500sqft (0.1-46.5sqm) alloy construction.

Configurations: Top vapor outlet, bottom vapor outlet, short path (molecular still), standard vacuum, high vacuum, high viscosity

Pressure Vessel Design: GMM Pfaudler Equilloy is certified to design and build equipment under all major global pressure vessel codes, including ASME, PED, DIN, TUV, AD 2000, TEMA, SELO, and GB150

Jacket Designs: Conventional; half-pipe; multiple zones; panel coils

One of the many 500 sq. ft. Wiped Film Evaporators that we have designed and manufactured over the years is being commissioned at our customers site.





Borosilicate glass lab WFE



A 1.2 sq. ft. pilot WFE system installed at our customers site.

A 500 sq. ft. Wiped Film Evaporator shell assembly as it's leaving our Rochester NY facility. The 125 sq. ft. drive and rotor assembly shown is being moved down our assembly bay ready to be installed in the Wiped Film Evaporator jacketed shell.

Wiped Film Evaporator Typical Product Applications



Chemicals:

Acid chlorides, amino acid, TEA, DEA, caprolactam, chlorinated hydrocarbons, cumene hydroperoxide, acetic acid, dimethyl sulfoxide, dioctyl phthalate, dyes, ethanolamines, glycols, insecticides, petroleum sulfonates, urea, herbicides, and EPDM.



Pharmaceuticals and Nutraceuticals: Amino acids, alkaloids, Omega 3 (fish oil) biochemicals, penicillin, vitamin E tocopherols, vitamin C, steroid derivatives, and cannabidol (CBD).

Polymers and Resins:

Epoxy resin, latex, synthetic rubber, polystyrene, phenolic resins, adhesives, resinco-polymers, isocyanates, urethane pre-polymers, PTMEG, PTA, acrylates, silicones, and styrene monomer.





Food:

Tomato paste, milk whey & proteins & solids, fruit nectars, chicken stock, fish protein, vanillin, corn syrup, fruit purees, marigold extract, and various flavorings.



Fats and Oils:

Cotton seed oil, dimer and trimer acids, distilled monoglycerides, glycerin, mineral oils, paraffin, rosin, acids, tall oil, fatty acids, fatty amides, fragrances, essential oils and palm oil.

Other:

Coal tar products, fire retardants, rubber coatings, paint wash solvents, oil re-refining lube oils, tall oil and pitch, catalyst recovery, solvent recovery, and nuclear waste reduction.



Green Chemistry:

Green chemicals from biomass and carbon capture, biodiesel, and glycerin.

Our Wiped Film Evaporator Unique Design Advantages

Slotted Wiper Blades

Unique wiper blade designs effectively spread the feed material into a thin film on the wall for better heat transfer. The wiper blades move and agitate the product down the heated wall in matter of seconds to minimize residence time.

Low Rotor Speed

High rotor speeds are not necessary. The high heat transfer coefficient, provided by our WFE design, requires lower rotor speeds, which greatly extends the service life of the wiper blades, mechanical seal and drive bearing.

No Bottom Steady Bearing

Our WFE rotor is supported entirely from the top drive and bearing assembly, all mounted to the WFE cover and main shell flange. The robust overhung drive design eliminates the need for a bottom bearing and eliminates associated high maintenance and replacement cost. With no bottom steady bearing, no flux oil is required, which is critical when the non-volatiles (heavies) are the product.

Expandable WFE sizes

For some models, additional thermal sections can be installed above the original thermal section at your plant site to provide future increased capacity for existing WFE's.

Easy Rotor Removal

Any size WFE rotor can be removed and reinstalled in 30 minutes or less. Simply disconnect the motor leads, feed line, and the main flange bolting, then lift the rotor out of the shell as one complete assembly. This allows for quick, easy, inspection, maintenance, and cleaning.

Internal Condenser

Our WFE design with no bottom steady bearing allows for the installation of an internal condenser and thus minimizes pressure drop to allow for deep vacuum operation. The deep vacuum operation and the proximity of the condenser surface to the heated wall, provides better separation and ensures complete condensation and sub-cooling.

Efficient Entrainment Separators

Specially designed full-length entrainment separators for standard and deep vacuum operation effectively remove entrained droplets from the vapor stream and improve the purity of the distillate product.

High Vacuum Operation

Our high vacuum design WFE can operate to vacuum levels as low as one micron (.001 torr). Operating at deep vacuum lowers operating temperatures, prevents thermal degradation, and lowers the boiling point.

Bottoms Outlet

For viscous materials with high melting points, the WFE bottom head can be heated and extruder blades can be utilized to mechanically aid in the discharge of bottoms material.

Low Maintenance

Depending on the application, we typically recommend only one shutdown per year for 1-2 days for inspection and maintenance. Mechanical seals typically last for many years due to our low rotational speeds. There is no bottom bearing and thus no costly maintenance.

Drives

Our unique WFE drive assembly enables our customers to easily access the mechanical seal for replacement without having to remove the complete rotor assembly on larger WFE's minimizing down time and extra costs associated with overhead cranes.



Our WFE Operation

Our WFE operating features, such as high vacuum (short path) distillation, short residence time and a highly agitated thin film on the heated surface, makes it ideally suited to handle a wide range of heat sensitive, high boiling, fouling, and viscous materials.



Feed enters at the top of the Wiped Film Evaporator through the feed inlet nozzle (1) onto the rotating feed distributor plate (2) powered by a gearbox and electric motor (12). The distributor plate evenly disperses the feed material onto the heated shell of the Wiped Film Evaporator.

Feed Inter Distributor Condenser The feed material moves down the heated wall of the Wiped Film Evaporator by gravity while the slotted wiper blades (3) spread the feed material as a thin film on the wall and pump/ agitate the feed down the heated shell of the WFE. Heat transfer under vacuum conditions, introduced by a heated jacket (4) surrounding the shell, causes volatile compounds to evaporate at reduced temperatures.



Vapor passes through the rotating entrainment separator (5) and condenses on the internal condenser (6) and flows out through the distillate nozzle (7) as a liquid. Cooling water flows through the internal condenser via the cooling water inlet (10) and outlet nozzle (11). Entrained liquid droplets, impinging on the entrainment separator, are thrown back to the heated shell by centrifugal force. Noncondensibles flow through the WFE and exit through the vacuum outlet nozzle (8). The remaining heavies (non-volatiles) stream exits through the bottoms outlet nozzle (9). For viscous heavies, optional extruder blades mechanically force the heavies stream out of the WFE.

Our WFE Condensers, Robust Drives, and Entrainment Separators

- Robust drive assemblies eliminate the need for a steady bearing.
- Internal condensers allow the WFE to operate as a true short path evaporator.
- The unique design of the wiper blades agitate and move the feed material down the heated wall in seconds.
- The HFSP entrainment separators minimizes pressure drop.



Two 250 sq. ft. HFSP entrainment separators



Carbon graphite centrifugal blade installed.



1100 Sq. Ft. WFE internal condenser



The Pfaudler robust drive assembly



HIGH QUALITY COMPONENTS

Our Wiper Blade and Entrainment Separator Designs



Centrifugally operated for materials of low to medium viscosity, generally less than 2,000 cps



Spring-mounted for materials that contain solids, have fouling tendencies or viscosities above 2,000 cps

Entrainment Separator Designs (top view)







LFHV



LF – For low vapor flow, low split and normal vacuum operation down to 1mmhg



HFHV – Higher percent open area for higher vapor flows and higher vacuum



LVHV – For ultra-high vacuum operation

Wiped Film Evaporator Standard Sizes (English)

(custom sizes and configurations provided upon request)

		Dimensions (inches)*				Est. WFE weights				Standard Specifications*			
WFE Area	Internal Condenser Area	Jkt O.D.	Overall Height	Rotor** Pull Height	Condenser Removal	WFE Empty	WFE with water	Drive Rotor Assembly	Condenser	Jacket Volume	Motor HP & Rotor Speed	Pressure Ratings (PSIG) @650 [F	
Sq. Ft.	Sq. Ft.	А	В	С	D	lbs	lbs	lbs	lbs	Gal.	HP/RPM	Jacket	Inner Shell
Standard Vacuum Design (High Vacuum Design)													
1.2	4.9	8.6	55	14	24	400	450	150	30	0.7	.75/560	300/FV/285	25/FV
4.2	7 (19)	14.8	68 (72)	20	27 (40)	1000	1100	400	100	2	2/291	100/FV/100	25/FV
8.8	12 (27)	14.8	87 (95)	40	48 (56)	1200	1600	550	300	4.4	2/291	100/FV/100	25/FV
13.4	16.7 (35)	14.8	110 (116)	54	66 (73)	1500	2100	800	400	6.6	3/291	100/FV/100	25/FV
21.5	50 (50)	24	130	60	68 (68)	3000	4000	1900	600	24	3/175	100/FV/100	25/FV
25	113 (121)	40	105 (124)	40	51 (75)	5000	8000	2300	950	26	3/97	150/FV/135	25/FV
32.3	87 (87)	24	160	90	105 (105)	3500	5500	2300	600	36	3/175	100/FV/100	25/FV
38	113 (150)	40	122 (141)	57	52 (90)	6000	9000	2700	950	40	3/97	125/FV/110	25/FV
51.2	150 (172)	40	137 (156)	73	70 (107)	7000	11000	3000	1200	53	3/97	125/FV/110	25/FV
77.3	150 (210)	40	197 (216)	112	70 (132)	9000	15000	4000	1200	79	3/97	135/FV/120	25/FV
88	150 (210)	40	215 (234)	130	70 (132)	11000	17500	4800	1200	90	7.5/97	125/FV/110	25/FV
103.4	215 (274)	40	245 (264)	150	105 (175)	14000	21500	5000	1300	106	7.5/97	125/FV/110	25/FV
125	215 (274)	40	290 (309)	180	105 (175)	16000	24000	8000	2000	115	15/97	100/FV/100	25/FV
140	215 (350)	54	245 (263)	150	105 (160)	16000	32000	8500	2000	175	15/70	100/FV/100	25/FV
160	215 (350)	54	285 (285)	170	105 (160)	22000	37000	9000	2000	200	15/70	100/FV/100	25/FV
204	215 (350)	54	335 (335)	220	105(160)	25000	40000	12000	2000	260	15/70	100/FV/100	25/FV
231	400 (800)	65	320	195	180 (230)	42000	70000	13000	8000	160	25/60	100/FV/100	25/FV
290	400 (800)	65	396	240	180 (230)	45000	75000	14500	8000	190	30/60	100/FV/100	25/FV
350	1000	65	425	290	290	60000	96000	17500	9000	270	30/60	100/FV/100	25/FV
420	1000	90.8	400	250	240	65000	122000	25000	9000	340	50/45	75/FV/75	25/FV
500	1000	90.8	432	300	340	105000	175000	32000	9000	420	50/45	75/FV/75	25/FV

	Dime	nsions (inc	ches)*	Est	t. WFE weig	hts	Standard Specifications*				
WFE Area	Jkt O.D.	Overall Height	Rotor** Pull Height	WFE Empty	WFE with water	Drive Rotor Assembly	Jacket Volume	Motor HP & Rotor Speed	Pressure Ratings (PSIG) @650] F		
Sq. Ft.	А	В	С	lbs	lbs	lbs	Gal.	HP/RPM	Jacket	Inner Shell	
Tap Vapor Outlet Design											
1.2	8.6	55	23	400	450	150	0.7	.75/560	300/FV/285	25/FV	
4.2	14.8	68	30	1000	1200	500	2	2/291	100/FV/100	25/FV	
8.8	14.8	87	50	1200	1600	550	4.4	2/291	100/FV/100	25/FV	
13.4	14.8	110	64	1500	2100	800	6.6	3/291	100/FV/100	25/FV	
21.5	24	130	72	3000	4000	1900	24	3/175	100/FV/100	25/FV	
25	40	105	52	5000	8000	2300	26	3/97	150/FV/135	25/FV	
32.3	24	160	102	3500	5500	2300	36	3/175	100/FV/100	25/FV	
38	40	122	72	6000	9000	2700	40	3/97	125/FV/110	25/FV	
51.2	40	137	88	7000	11000	3000	53	3/97	125/FV/110	25/FV	
77.3	40	197	127	9000	15000	4000	79	3/97	135/FV/120	25/FV	
88	40	215	145	11000	17500	4800	90	7.5/97	125/FV/110	25/FV	
103.4	40	245	165	14000	21500	5000	106	7.5/97	125/FV/110	25/FV	
125	40	290	180	16000	24000	8000	115	15/97	100/FV/100	25/FV	
140	54	245	170	16000	32000	8500	175	15/70	100/FV/100	25/FV	
160	54	285	190	22000	37000	9000	200	15/70	100/FV/100	25/FV	
204	54	335	240	25000	40000	12000	260	15/70	100/FV/100	25/FV	
231	65	320	229	42000	70000	13000	160	25/60	100/FV/100	25/FV	
290	65	396	274	45000	75000	14500	190	30/60	100/FV/100	25/FV	
350	65	425	324	60000	96000	17500	270	30/60	100/FV/100	25/FV	
420	90.8	400	284	65000	122000	25000	340	50/45	75/FV/75	25/FV	

** Rotor Pull height does not include rigging requirements

All Data noted above is approximate

Custom sizes and styles are designed and manufactured as required for an application.

Wiped Film Evaporator Standard Sizes (Metric)

(custom sizes and configurations provided upon request)

	Dimensions (millimeters)*				ers)*	Est. WFE weights				Standard Specifications*			
WFE Area	Internal Condenser Area	Jkt O.D.	Overall Height	Rotor** Pull Height	Condenser Removal	WFE Empty	WFE with water	Drive Rotor Assembly	Condenser	Jacket Volume	Motor HP & Rotor Speed	Pressure Ratings (barg) @343] C	
Sq. m.	Sq. m.	А	В	С	D	kg.	kg.	kg.	kg.	Liter	KW/RPM	Jacket	Inner Shell
Standard Vacuum Design (High Vacuum Design)													
0.11	0.46	215	55	350	600	181	204	68	14	3	.56/560	21/FV/20	1.7/FV
0.39	.65 (1.8)	370	68 (72)	500	675 (1000)	454	499	181	45	8	1.5/291	6.9/FV/6.9	1.7/FV
0.82	1.1 (2.5)	370	87 (95)	1000	1200 (1400)	544	726	249	136	17	1.5/291	6.9/FV/6.9	1.7/FV
1.24	1.5 (3.2)	370	110 (116)	1350	1650 (1825)	680	953	363	181	25	1.5/291	6.9/FV/6.9	1.7/FV
2.00	4.6 (4.6)	600	130	1500	1700 (1700)	1361	1814	862	272	91	2.2/175	6.9/FV/6.9	1.7/FV
2.32	10.5 (11.2)	1000	105 (124)	1000	1275 (1875)	2268	3629	1043	431	98	2.2/97	10.3/FV/9.3	1.7/FV
3.00	8(8)	600	160	2250	2625 (2625)	1588	2495	1043	272	136	2.2/175	6.9/FV/6.9	1.7/FV
3.53	10.5(14)	1000	122 (141)	1425	1300 (2250)	2722	4082	1225	431	151	2.2/97	8.6/FV/7.6	1.7/FV
4.76	14(16)	1000	137 (156)	1825	1750 (2675)	3175	4989	1361	544	201	2.2/97	8.6/FV/7.6	1.7/FV
7.18	14(19.5)	1000	197 (216)	2800	1750 (3300)	4082	6804	1814	544	299	2.2/97	9.3/FV/8.3	1.7/FV
8.18	14 (19.5)	1000	215 (234)	3250	1750 (3300)	4989	7938	2177	544	341	5.6/97	8.6/FV/7.6	1.7/FV
9.61	20(25.4)	1000	245 (264)	3750	2625 (4375)	6350	9752	2268	590	401	5.6/97	8.6/FV/7.6	1.7/FV
11.61	20(25.4)	1000	290 (309)	4500	2626 (4375)	7257	10886	3629	907	435	15/97	6.9/FV/6.9	1.7/FV
13.01	20(32.5)	1350	245 (263)	3750	2625 (4000)	7257	14515	3856	907	662	11/97	6.9/FV/6.9	1.7/FV
14.86	20(32.5)	1350	285 (285)	4250	2625 (4000)	9979	16783	4082	907	757	11/97	6.9/FV/6.9	1.7/FV
18.95	20(32.5)	1350	335 (335)	5500	2626 (4000)	11340	18144	5443	907	984	11/97	6.9/FV/6.9	1.7/FV
21.46	37(74.3)	1625	320	4875	4500 (5750)	19051	31751	5897	3629	605	18/60	6.9/FV/6.9	1.7/FV
26.94	37(74.3)	1625	396	6000	4500 (5750)	20412	34019	6577	3629	719	22/60	6.9/FV/6.9	1.7/FV
32.52	92.90	1625	425	7250	7250	27215	43545	7938	4082	1022	22/60	6.9/FV/6.9	1.7/FV
39.02	92.90	2270	400	6250	6000	29483	55338	11340	4082	1287	37/45	5.2/FV/5.2	1.7/FV
46.45	92.90	2270	432	7500	8500	47627	79378	14515	4082	1589	37/45	5.2/FV/5.2	1.7/FV

						,					
WFE Area	Jkt O.D.	D. Overall Rotor** D. Height Pull Height		WFE Empty WFE with Dr water A:		Drive Rotor Assembly	Jacket Volume	Motor HP & Rotor Speed	Pressure Rat @34	tings (barg) 3] C	
Sq. m.	А	В	С	kg.	kg.	kg.	Liter	KW/RPM	Jacket	Inner Shell	
Standard Vacuum Design (High Vacuum Design)											
0.11	215	1375	575	181	204	150	3	.56/560	21/FV/20	1.7/FV	
0.39	370	1700	750	454	499	500	8	1.5/291	6.9/FV/6.9	1.7/FV	
0.82	370	2175	1250	544	726	550	17	1.5/291	6.9/FV/6.9	1.7/FV	
1.24	370	2750	1600	680	953	800	25	1.5/291	6.9/FV/6.9	1.7/FV	
2.00	600	3250	1800	1361	1814	1900	91	2.2/175	6.9/FV/6.9	1.7/FV	
2.32	1000	2625	1300	2268	3629	2300	98	2.2/97	10.3/FV/9.3	1.7/FV	
3.00	600	4000	2550	1588	2495	2300	136	2.2/175	6.9/FV/6.9	1.7/FV	
3.53	1000	3050	1800	2722	4082	2700	151	2.2/97	8.6/FV/7.6	1.7/FV	
4.76	1000	3425	2200	3175	4989	3000	201	2.2/97	8.6/FV/7.6	1.7/FV	
7.18	1000	4925	3175	4082	6804	4000	299	2.2/97	9.3/FV/8.3	1.7/FV	
8.18	1000	5375	3625	4989	7938	4800	341	5.6/97	8.6/FV/7.6	1.7/FV	
9.61	1000	6125	4125	6350	9752	5000	401	5.6/97	8.6/FV/7.6	1.7/FV	
13.01	1350	6125	4250	7257	10886	8500	662	11/97	6.9/FV/6.9	1.7/FV	
14.86	1350	7125	4750	7257	14515	9000	757	11/97	6.9/FV/6.9	1.7/FV	
18.95	1350	8375	6000	9979	16783	12000	984	11/97	6.9/FV/6.9	1.7/FV	
21.46	1625	8000	5725	11340	18144	13000	605	18/60	6.9/FV/6.9	1.7/FV	
26.94	1625	9900	6850	19051	31751	14500	719	22/60	6.9/FV/6.9	1.7/FV	
32.52	1625	10625	8100	20412	34019	17500	1022	22/60	6.9/FV/6.9	1.7/FV	
39.02	2270	10000	7100	27215	43545	25000	1287	37/45	5.2/FV/5.2	1.7/FV	

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** Rotor Pull height does not include rigging requirements

All Data noted above is approximate

Custom sizes and styles are designed and manufactured as required for an application.

Complete WFE Systems

We introduced our WFE technology to the world in the early 1950's and since that time, GMM Pfaudler has also been designing complete process systems with the WFE technology at the core. Our focus is to provide our customers with the most efficient and reliable overall system to obtain the optimal performance for their process.

Besides the WFE itself, there are many other critical aspects of a complete WFE process system including pre-heat, de-gas, devolatilization, vacuum, heating and cooling utilities and product and waste handling. Our capabilities do not end with the engineering, manufacturing, and testing of the WFE. Leveraging vast chemical processing knowledge and experience, our chemical process engineers incorporate WFE's into complete, fully integrated, efficiently operating process systems. The complete system includes the design of all the unit operations surrounding and supporting the WFE, including, but not limited to:

- Feed flow control
- Preheat, while preventing degradation and fouling
- Degassing to minimize load on the vacuum system
- WFE design for optimum separation, yield and purity
- Product cooling to avoid degradation
- Jacket flow rate and temperature control to maximize heat transfer and through put
- Condenser flow rate and temperature control
- High quality components for minimal maintenance and long life
- Proper system layouts for performance and ease of maintenance



Each system is designed specifically for our client's process. The layout is custom designed in order to ensure proper system functionality and to ensure that all equipment, instruments and valves are arranged for ease of operation and maintenance. This single source responsibility ensures that the design of every component is integrated into a complete system design to ensure proper system performance. This provides reduced costs, shorter schedule and high quality construction.

Complete Modular Systems include the following:

Structural Steel **Technical Specifications** Cost Control Equipment Schedule Control Instrumentation Modular Design Installation Piping 3D System Layout/Design Control Logic **Guaranteed Performance** Controls **Project Engineering** Commissioning Process Engineering and Design **Project Management** Training **Process Hazard Analysis** Fast Track Schedule Maintenance Materials Engineering Documentation Spare Parts Design and Construction Codes Procurement

Modular Construction

Higher quality... lowering cost... shortened schedule

Gmm Pfaudler Systems completes systems designs in either traditional field construction or modular design mode. Modular design and fabrication has many benefits.

Modules are fabricated in the controlled working environment of the shop which provides for higher **quality fabrication**. Shop fabrication is also much more efficient than field fabrication thus requiring fewer hours to complete which results in a **lower cost** as well as **shorter project schedule**.

Fixed Price for Complete Modular System -

allows for early and accurate customer total project cost estimates and no surprise field installation costs.

Single Source Responsibility - for all engineering, design and fabrication ensures a fully integrated and properly functioning system.

Fast Track Project Schedules – ensured with single source responsibility and highly efficient shop labor for modular construction. Systems are pre-acceptance tested in the shop shortening commissioning time.

Significantly Lower Project Costs – due to utilization of highly efficient shop labor versus field labor.







WFE Systems



MODULAR CONSTRUCTION

SINGLE SOURCE RESPONSABILITY

Instrumentation & Controls

Improving quality and yield... ensuring safety



As a world leader in process system solutions, we provide complete process systems for Reaction, Evaporation, Distillation, Filtration and Drying. These chemical process systems include all of the **process instrumentation** required for the proper, efficient and safe startup, operation and shutdown of your process including all PID control loops as well as process and safety interlocks. We provide a control logic definition and all other necessary **instrument documentation** required for our customers, or their local controls integrators, to program their existing central plant control system.

For customers without existing central plant control systems, we provide a **complete control system** consisting of a programmable logic controller (PLC) and human machine interface (HMI) to fully automate the process system. We program the PLC for the process and program the HMI with all the operating screens, setpoint screens, alarms screens, historical trending and data collection. The HMI is provided as either a panel mounted or desktop PC station. All control systems are **fully factory acceptance tested** and our controls engineer is on site for assistance during commissioning.

In combination with the PLC/HMI system above, we can also integrate a supervisory control and data acquisition system.



Pilot Testing

Performance testing, process optimization, data collection

Before chemical production begins, or construction starts, and before engineers design the facility, an optimal chemical process must be developed, and proven. At GMM Pfaudler's world-class Process Test Facility, our experienced chemical process engineers develop & optimize your process, and collect the data required to design your commercial-scale facility.

Typical purposes for testing at GMM Pfaudler's Process Test Facility include new process development, yield and purity improvement, process optimization for cost-reduction and increased profit, and VOC reduction to meet environmental regulations. Our Process Test Facility, can be configured for a variety of evaporation operations. Multiple utility systems provide a wide range of operating conditions, including: a high-capacity multi-stage vacuum system, for vacuum down to less than 0.01 millibar, hot thermal oil up to 345°C, steam to 180°C and water systems from -12° to 140°C.

The Process Test Facility is designed to process flammable and corrosive chemicals, in volumes ranging from lab samples, to IBC(Intermediate Bulk Containers) tank quantities.

Pilot testing concludes with a comprehensive report that includes the scope, objectives, and sample analytical results, accompanied by conclusions, and recommendations.



Technical Field Services

Planning, Testing, Consulting, Installations, Maintenance







Our engineering, technical and after-market parts and services are there to keep your chemical process system running smoothly and efficiently.

Our engineers work closely with you to troubleshoot your existing process and design and install process upgrades to help achieve improved efficiency, reduced maintenance, improved reliability, reduced operating costs and increased system uptime.

Our technicians will provide for all of your equipment maintenance requirements from installation to repairs and preventive maintenance. They will also work with you upfront and during your projects, carrying out engineering studies, pilot testing, feasibility studies and general consulting.



Engineering

- Consultancy services
- Pilot testing / toll operation
- Process engineering
- Troubleshooting

Construction

- Planning / scheduling
- Project management
- Installations
- Safety

Maintenance and aftersales

- Spare / Replacement Parts
- Maintenance
- Upgrades and process improvements
- Shutdown services
- Repairs

Worldwide Presence





GMM Pfaudler is a global leader in corrosion-resistant technologies, systems, and services for the chemical, pharmaceutical, food and energy industry.

Our Branded Product Lines that include PFAUDLER, NORMAG, MAVAG, MIXION, INTERSEAL, EQUILLOY, EDLON and HYDROAIR showcase our strength as a group, our capabilities, and our pursuit for constant innovation. With an end-to-end solutionsoriented approach, a global footprint, and a perfectly integrated offering system we are able to meet complex industry demands worldwide.

GMM Pfaudler is driven by 1800+ individuals across 4 continents and 15 global manufacturing facilities around the world. The Group's targeted investments in strategic markets, innovation and competitiveness paves the way forward for GMM Pfaudler's continued legacy. 80+ Countries

1800+ Employees

04 Continents

Our Global Contacts





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