EDLON™
Corrosion-Resistant Column Systems
If asked to choose between a design that either maximized performance or extended service life, most engineers working with corrosive chemicals would want both. As well they should.

But all too often the design criteria and material selection that adds long service life are forgotten until the very end, and thus corrosion resistance becomes an afterthought. The result: optimum system performance is never quite achieved.

At Edlon, we address corrosion resistance at the earliest design stages — and we encourage you to do the same. No matter what the application, the proper choice of materials is dependent upon process conditions and column configuration.

An Edlon design accounts for all three: material, chemistry and process. And an Edlon design never sacrifices column performance, even in the most stringent operating conditions.

If you’re faced with a corrosive processing problem, you don’t have to face it alone. Edlon can contribute experience, technology and dedicated professionals. We can be your single source — and your best source — for equipment and column design. We can find the most cost-effective solution to help you fight corrosion, maintain purity, combat fouling and improve mass transfer.

Over the past 50 years, Edlon has gained expertise in every phase of design for corrosive service. We are skilled in corrosion chemistry. We are masters of mass transfer engineering. And we are the world’s leading user of corrosion-resistant materials — for every conceivable mass transfer application.

Edlon engineers have designed or been design consultants on thousands of columns in the widest variety of industrial applications. Put our experience to work for you — early in the design.
Edlon, Inc. Gives You More Choices

Coatings, Loose liners, Bonded liners, Solid fluoropolymer internals

Edlon has a broader spectrum of corrosion-resistant materials to choose from than any other mass transfer equipment supplier. Edlon offers coatings and linings in a full range of thicknesses, including loose liners and glass-backed liners bonded to steel with proprietary adhesives. Such diversity, particularly with fluoropolymers, allows us to explore alternatives until we find the best solution.

Most often, we will use a variety of fluoropolymer products to create a complete solution. For example, an FEP Teflon®-lined column with isostatically molded Teflon PTFE feed pipes might incorporate PFA molded packing and coated internals. Because we have more options available, we are able to maximize the service life of the vessel, its internals, piping, and any downstream equipment.

Make Edlon, Inc. Your First Choice For Engineering

HF, HCl, Nitric acid, Sulfuric acid, Caustics, Organics, High Temperature, Combinations of these chemical services

Expert engineering design assistance from Edlon can help you solve your application problems. Our design capabilities allow us to match overall column design to specific chemical processes, taking into account column size, throughput, tray hydraulics, packing properties, heating and cooling demands, as well as corrosion resistance.

As is often the case with column systems, stream composition can change dramatically over short periods of time. You can count on an Edlon design to handle these deviations and maintain optimum system performance. And when off-the-shelf internals just won’t do the job Edlon can custom fabricate high-performance packing and internals.
Edlon fluoropolymer-lined columns and vessels provide options that allow a custom fit based on your process parameters. Select from a wide range of liners and coatings, various metals, bolting arrangements and nozzle designs for a customized, economical design that meets your performance parameters.

**Metal Shell**

Carbon steel shells are standard but stainless steel (304, 316 and L grades), produced in varying thickness and code designs, is available as well. We use only full penetration welds on all of our columns, and a complete x-ray analysis is available upon customer request. Support brackets, movable bands and vent couplings can be added to further customize any design.

Our fixed or rotating flanges are available in sizes up to 144 inches in diameter. These integral stub ends and rotating rings not only facilitate easy installation and bolt alignment, but dramatically reduce expensive welding labor. All flanges are available in ANSI, ASA or DIN configurations with various pressure capabilities. Carbon steel, stainless steel (including stainless steel clad), ductile iron, or even fluoropolymer coated or galvanized can be ordered when rotating back-ups are specified.

Edlon’s exclusive “bonded flare” is an option on the PTFE-lined integral lap joint. This bonded flare process was developed for use in glass-lined reactor protection rings and covers and has displayed years of resiliency under extreme conditions. It bonds the PTFE liner to the face of the metal flare providing a flat flare highly resistant to mechanical damage. It also ensures proper flare entrapment during critical handling.

Protective exterior surface treatments are available for corrosive environments. Edlon’s blast and paint facilities are capable of applying even the most difficult multipart coatings.

**Heads**

Flat or dished heads are available with nozzle designs at customer option.

**Finish Treatment**

Edlon can supply a customized finish treatment that includes support skirts, lugs, clips, ladders, platforms, assembly and testing.

**Nozzles**

Edlon offers a wide range of nozzles in sizes up to the actual vessel diameter. Location and number is limited by proximity to other nozzles and flanges. Nozzle designs can be either mechanically sealed or permanently welded as shown below.
**Bonded Liners, Loose Liners and Coatings**

Edlon provides bonded liners, loose liners and coatings in a variety of chemically inert materials that feature a smooth, non-stick surface and maximum heat, permeation and corrosion resistance. Following is a list of standard materials that offer superior performance characteristics in a wide range of operating conditions. Please consult Edlon-PSI for chemical resistance and temperature considerations in selecting the proper materials. Liner thickness is based on application requirements.

**PP (Polypropylene)** — An economical lining material, PP handles fluids from 0°F to a maximum of 225°F and, like PVDF, maximum operating temperature varies with chemical service. It should be protected from low temperature impact by heat tracing.

**PVDF (Polyvinylidene Fluoride)** — Noted for its abrasion and permeation resistance, PVDF is rated for use at temperatures of 0°F to 275°F, but maximum temperature capability varies according to the process fluid involved. Although Edlon uses Kynar-Flex®, caution should be used to protect against impact at low temperatures. PVDF should be heat traced for uses below 32°F.

**ETFE (Ethylene Tetrafluoro-ethylene)** — With a reputation for excellent processability and high energy radiation protection, ETFE features maximum mechanical toughness and renowned chemical invulnerability. Its effective temperature range spans from -20°F to 300°F.

**ECTFE (Ethylene Chlorotrifluoro-ethylene)** — ECTFE offers excellent coating performance for many chemical environments from 0°F to 300°F. It features a very low gas and liquid permeation rate and is remarkably abrasion resistant.

**FEP (Fluorinated Ethylene Propylene)** — FEP offers excellent resistance to a broad range of chemicals and provides exceptional non-stick properties. It can be formed into complex shapes and is noted for its ability to retain its shape and flexibility at extremely low temperatures without stress cracking or embrittlement. FEP can withstand a maximum operating temperature of 300°F for most chemical environments.

**PFA (Perfluoro Alkoxy)** — PFA offers the excellent chemical resistance and the non-stick properties similar to FEP. It can also be formed into complex designs and likewise retains its shape and flexibility at extremely low temperatures without cracking or disbonding. PFA, however, offers greater flex-life than FEP and can withstand a higher maximum operating temperature to 400°F.

**PTFE (Polytetrafluoroethylene)** — Capable of handling most media from a minimum of -40°F to a maximum of 500°F, PTFE will not contaminate ultra-pure processes. It features excellent non-stick properties and corrosion resistance and dramatically reduces the risk of damage from thermal shock. Temperature variation does not affect chemical resistance and PTFE has excellent low temperature impact resistance.
Packed columns by Edlon provide desired mass transfer even under demanding, highly-corrosive conditions. Process conditions in corrosive systems are particularly hard on equipment. Variables such as operating temperatures, flow rates and the presence of corrosive vapors or particulate matter take on special significance in these systems.

Edlon's thirty years of experience in designing both packing and packed scrubber systems provides assurance that your system will perform to your expectations. Packed scrubber system designs often incorporate combinations of venturi scrubbers, cyclones, and knock-out drums. Successful design and manufacture of these multi-component systems enable us to handle severe problems such as scrubbing hot effluent gas or exothermic reactions. The following are some of the more typical design applications:

**A. Countercurrent Packed Bed**

Eliminate Vapor Contamination

Either absorption or chemical reaction will remove vapor contamination in a conventional packed bed scrubber. Edlon designs countercurrent packed beds to accommodate either process to contain any corrosive chemicals generated.

**B. Packed Tower Absorber**

Reduce Particulates While Minimizing Scrubber Size

In applications where corrosive vapors and significant particulate matter are a concern, Edlon designs a combination unit consisting of a single co-current eductor venturi and a cyclonic separator, followed by the appropriate packed countercurrent scrubber. The venturi absorbs some of the off-gases, lowers the temperature of the corrosive vapors and acts as the first stage of the scrubber. This sequence reduces fouling and minimizes the size of the packed bed absorber.

**C. Two-Stage Countercurrent Packed Bed Scrubber**

Eliminate Gas Mixture Contamination

This two-stage countercurrent design can be used to remove a mixture of gases. Two scrubbing liquids recirculate through the separate sections of the packed bed. This configuration allows removal of one component of the mixture of corrosive gases, reducing the load on the second stage. Alternately, the top section of the bed can be used as a scrubber and the bottom section as a stripper.

**D. Co-Current and Countercurrent System**

Manage Hot Vapor Streams

This combination unit includes a venturi and the two-stage countercurrent packed bed scrubber. The venturi stage creates the draft to pull the gas into the scrubber, lowers the temperature of the entering gas stream, and reduces the concentration of effluent in the gas stream to more manageable levels. The mist eliminator provides efficient moisture removal prior to the clean gas discharge.
Random Packing

Plastic packing is recommended for Glasteel® or fluoropolymer columns. Edlon works closely with other packing suppliers to provide the best packing solutions for your process. We can supply either random or structured packing designs in materials ranging from polypropylene to Tefzel® or Teflon®. For more severe applications, Edlon manufactures its own line of tough, heat- and chemical-resistant PTFE packings. Column diameter, packed bed height, operating temperatures and pressure drop ultimately dictate the type of packings specified. Edlon's engineers match the mass transfer requirements to the optimum packing for service in corrosive environments. Several of the packing types available are listed below:

**Edlon Raschig rings** are the workhorse of the industry for corrosive service. Isostatically molded from chemically inert PTFE, this packing resists product buildup, is unbreakable, and can withstand temperatures up to 350°F (177°C).

**Edlon PTFE Exlon™ rings** combine high surface area and void space with high-temperature performance to increase mass transfer and reduce pressure drop. Compression molded from virgin PTFE, Exlon rings have the highest crush resistance of any plastic packing. They have been tested for structural integrity to 350°F (177°C) at a packed bed height of fifteen feet (4.6m).

**Cascade Mini Rings®** (CMR® random packing) are unique low aspect ratio rings with mass transfer efficiency that runs 5-10% higher than other dumped packings. The lower nesting properties of CMRs enhance thin film contact and liquid distribution. This leads to less channeling, fewer dry spots and less corrosion.

**Ballast Bio-Rings™** are the most economical choice under certain service conditions. Similar to the Pall-type rings in dimension and surface area, their cylindrical shape resists crushing, will not trap liquid, and provides high surface area and high void space.

**Ballast Saddle™** random packing is a high capacity packing with a drip point design that promotes high mass transfer rates through effective liquid surface renewal. Bed settling is minimized due to the interlocking nature of the drip point design.

Data sheets are available for more detailed information.
Edlon packed column internals are made from corrosion resistant plastics and customized to each application. Optimization is the goal when retrofitting existing columns or constructing new units. Edlon distributors, redistributors, feed pipes, gas spargers and packing support plates combine corrosion resistance with performance and superior structural integrity. The long-term stability of the column internals is of particular concern in high temperature or in process upset conditions. Unique configurations and innovative designs by our engineers add value and performance that the competition can’t match.

Orifice-riser type distributors combine a standard orifice and weir type distributor to handle a wider range of liquid flow rates. Edlon’s unique design is frequently specified for packed columns up to 40 inches (1.0m) in diameter; it provides uniform liquid distribution with a high turn-down capacity and is inherently non-fouling. The separate path for liquid flow permits free gas passage through the risers, resulting in a low pressure drop and reduced liquid entrainment.

Ladder distributors disperse clean or filtered feed liquid under pressure and provide uniform distribution over the packed bed at liquid rates up to 12 gpm/ft. The pipework ladder leaves a large free area and is preferred for applications that require high gas flow rates with minimum obstruction. Standard sizes are available for columns from 24 inches (0.6m) up to 120 inches (3.0m) in diameter.

Combination orifice distributor/bed limiter reduces the number of support rings in glass or fluoropolymer-lined columns. It lowers costs and limits flanged connections because the distributor pan is rigidly supported above the bed limiter.

Solid Teflon® PTFE feed pipes and spargers are fabricated from isostatically molded heavy-wall PTFE tubing and are suitable for columns up to 3 feet (1.0m) in diameter and service temperatures up to 350°F (177°C).

Multi-arch packing supports combine the corrosion resistance of PTFE and the strength of Pyrex® glass in a design that separates liquid and vapor flow paths for minimum pressure drop. Vapor flows up into the packed bed through the higher openings in the arches, while liquid can move downward through the spaces between the arches. All PTFE construction is available for HF or strong caustics.

PTFE-lined and jacketed steel feed pipes and spargers combine the superior corrosion resistance of isostatically molded PTFE with the strength and rigidity of steel for large diameter column applications. They are recommended for columns over 3 feet (1.0m) in diameter.
Tray Columns

Success in designing fluoropolymer tray columns depends on knowledge of materials and experience in optimizing mass transfer engineering. Edlon is without peer in the design, fabrication and installation of efficient corrosion-resistant tray columns.

Fluoropolymers have significantly different structural properties from metals. Bending or forming fluoropolymer components requires special techniques; welding tray components is not always practical. Ensuring a tray’s uniform flat surface is vital to maintaining proper tray hydraulics. To achieve structural integrity, the design must take into account the proper support and reinforcement requirements and control stress levels.

In many instances, reinforcing elements of other high-modulus materials are encapsulated in a protective fluoropolymer coating and incorporated into the design. Edlon is experienced and successful with such design innovations and solutions.

Producing a uniform surface on a fluoropolymer coated tray requires proper design, a precision application of a uniform thickness of fluoropolymer, and precise control of firing temperatures. The experienced engineers at Edlon understand these requirements and Edlon’s proprietary coating processes ensure uniformity.
### Physical Properties (Material Only)

<table>
<thead>
<tr>
<th>Property</th>
<th>PP</th>
<th>PVDF</th>
<th>ECTFE</th>
<th>ETFE</th>
<th>FEP</th>
<th>PFA</th>
<th>PTFE</th>
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</thead>
<tbody>
<tr>
<td>Melting Point (°F/°C)</td>
<td>338 (170)</td>
<td>340 (171)</td>
<td>460 (238)</td>
<td>512 (267)</td>
<td>500 (260)</td>
<td>582 (306)</td>
<td>621 (327)</td>
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<tr>
<td>Tensile Strength (PSI)</td>
<td>4800</td>
<td>5200</td>
<td>4500</td>
<td>6500</td>
<td>4100</td>
<td>4000</td>
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<td>Specific Gravity</td>
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<td>1.85</td>
<td>1.70</td>
<td>1.70-1.86</td>
<td>2.14-2.17</td>
<td>2.13-2.16</td>
<td>2.13-2.20</td>
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<tr>
<td>Flexural Modulus (PSI)</td>
<td>180,000</td>
<td>250,000</td>
<td>240,000</td>
<td>170,000</td>
<td>80,000</td>
<td>90,000</td>
<td>70,000</td>
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<tr>
<td>Coefficient of Thermal Expansion (in./in. °F x 10^{-5})</td>
<td>5.0-10.0</td>
<td>4.0-8.0</td>
<td>5.6</td>
<td>7.6</td>
<td>7.5</td>
<td>7.8</td>
<td>5.5</td>
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<tr>
<td>Operating Temperature Range (°F)</td>
<td>Up to 225</td>
<td>Up to 275</td>
<td>Up to 300</td>
<td>Up to 300</td>
<td>Up to 300</td>
<td>Up to 400</td>
<td>Up to 500</td>
</tr>
</tbody>
</table>

### Chemical Properties

Relative Corrosion Resistance vs. Temperature for Edlon-PSI Coating and other Plastics

![Chemical Properties Diagram]

- **PP, PVC**
- **PE**
- **PVDF**
- **ECTFE**
- **ETFE**
- **FEP**
- **PTFE**
- **PFA**
Before you begin planning your vessel or other process equipment requirements, call Edlon. We are a single source for equipment and system design offering:

- Quality engineering to optimize designs
- Unmatched corrosion expertise
- Efficient, reliable process equipment
- Numerous design options
- Various corrosion-resistant materials
- Proprietary fabrication techniques for hard-to-work materials
- Nationwide service network
- 48 hour delivery on standard replacement parts
- Equipment reconditioning services

A century of process equipment experience and know-how is reflected in the quality of engineering and workmanship that goes into every Edlon design and product.

**Why Choose Edlon?**

- Experience
- Advanced Technology
- Dedicated Professionals

Three very good reasons to make Edlon your first choice for both engineering services and process equipment fabrication.
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