

## Bulletin No. 200

### Industries and Applications for Stirred Reactors, Pressure Vessels, and Reactor Systems

A discussion of industries and applications for pressure equipment.

Parr pressure equipment is used in a wide variety of industries and applications. A list of typical industries and applications for our Stirred Reactors, Pressure Vessels, and Reactor Systems is provided below followed by brief descriptions of some of the applications.

Industries		
Academic Research	Fragrance	Organic Chemistry
Beauty & Cosmetics	Government	Petrochemical
Biotechnology	Life Sciences	Petroleum
Chemical	Medical	Pharmaceuticals
Energy	Military	Polymers
Flavors	Mining	Research Institutes
Food & Agriculture	Nano-Technology	Specialty Chemicals

Applications		
Acid Digestion	Electrochemistry	Nitrations
Alkaline Digestion	Extractions	Organic Synthesis
Biofuel Research	Fischer-Tropsch	Oxidations
Catalysis Development	Green/Sustainable Chemistry	Pharmaceutical Production
Catalysis Testing	Hydrometallurgy	Polymerization
Catalytic Hydrogenation	Hydrothermal Synthesis	Pressure Leaching
Chemical Reactions	Hydrotreating	Reforming
Corrosion Testing	Industrial Chemical Processing	Sample Preparation
Denitrogenations	Metathesis	Supercritical Fluids
Desulfurizations	Methanations	Syngas

## Pharmaceuticals

The easiest group of customers to identify and recognize are the pharmaceutical companies. These firms carry out hydrogenations over a wide range of pressures to create and modify new organic compounds. Many of these firms will have large central laboratories where these hydrogenations will be conducted by a highly specialized service group.

## Polymers

A second large group of users is in the polymer business where monomers are linked under high pressures and temperatures to produce fibers, plastics and related materials. Many times these customers will be identified by their request for special stirrers to deal with the higher viscosities associated with their polymers.

## Petroleum and Petrochemicals

The petroleum and petrochemical industry makes up a very large group of our customers. The applications within this field are extremely broad. Parr pressure vessels are used to assay core samples for exploration purposes. Drilling services companies use them to develop corrosion inhibitors for injection into the wells to protect down-hole equipment. Some corrosion labs have over thirty stirred reactors to evaluate the corrosive effects of any new petrochemical products or processes.

## Food and Agricultural Products

While not the largest market by any means, the food and agricultural products groups are a definite market for our products. Reactors are used for everything from decaffeinating coffee to developing carbonated candies. Many of our customers are working with starches. It should not be surprising that there are such a large number of users in this field when we remember that the first Parr stirred reactors were developed for Swift & Co. and Armour, over 50 years ago to hydrogenate vegetable oils. The Regional Research Laboratories of the U.S. Department of Agriculture and the Food and Drug Administration Laboratories also use Parr reactors for working with food and agricultural products.

## Catalyst Development and Testing

Catalytic hydrogenations are perhaps the most common reactions carried out with Parr stirred reactors. These applications span the entire chemical industry where these reactions are used. Catalyst manufacturers regularly use Parr reactors in their catalyst development and testing programs. Catalyst testing conducted by their customers also forms a significant market for these reactors.

## Hydrometallurgy

While most of the applications for Parr reactors are in the organic chemistry world, there are inorganic applications as well. Perhaps the largest single one of these is the field of hydrometallurgy where strong acids or caustics are used to extract metals from their ores. These reactors are used for the caustic extraction of aluminum from Bauxite and for assaying



the ores. Many companies are using these reactors to extract copper, nickel, and molybdenum in acidic media. In almost all cases, these applications require one of the special metal alloys for the reactor, such as Titanium, Monel 400, or one of the Hastelloy alloys.

## **Universities and Research Institutes**

Universities and other research institutes are again a major market for Parr reactors. In the chemical engineering departments, they can be used to simulate commercial reactions in the laboratory for teaching purposes. They are also used for research projects on any of the applications discussed in this TechNote. In the chemistry department, they will generally be used for advanced research projects.

## **Flavors and Fragrances**

Parr Reactors and Pressure Vessels are found throughout the laboratories of the Food and Fragrance industry where they are used to develop compounds that provide a particular taste or smell.

## **Life Sciences**

Many of the world's most famous Life Sciences companies, Institutes, and Universities thrive on the ability of Parr's Cell Disruption Vessels to efficiently and gently open up biological cells to allow internal organelles to be studied. The Parr Acid Digestion Vessels are also a popular tool to investigate biological pathways

## **Specialty and Commodity Chemicals**

Chemical companies of all types rely on Parr Reactors and Pressure Vessels to help them find new chemical paths. Some are used to learn how new reagents can be made into common products more quickly or at less cost. Others are used to discover new products that can be made from existing reagents.

## **Nano-Technology**

One of the newest fields of research is globally referred to as Nano-Technology. In this field of research, manipulations of chemical compounds in the size range of 1 to 100 nanometers are taking place. The production of such materials may take place under pressure and at elevated temperatures. The subsequent application of the Nano-materials may require the use of high pressure and high temperature as can be achieved with a Parr reactor.

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