

Phosphoric Acid Production

The Best Mixing Solution



**PHILADELPHIA
MIXING
SOLUTIONS**



**MIXING
SOLUTIONS
LIMITED**

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SOLUTIONS**



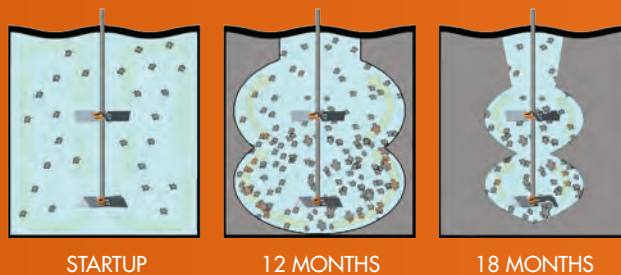
**MIXING
SOLUTIONS
LIMITED**

Philadelphia Mixing Solutions, Ltd™ and its subsidiary Mixing Solutions Limited™ lead the industry in providing customers with improved agitation and mixing processes for their mission-critical mixing operations. Backed by over 60 years of industry experience, and with a rich tradition of technology going back to our roots with the original Philadelphia Gear Corporation, our engineers can analyze, design and implement superior mixing operations in a wide variety of agitation applications.

THE MIXING CHALLENGE

The production of phosphoric acid is one of the most challenging in the mixing industry. The production process involves a series of reaction tanks where phosphate rock is reacted with sulfuric acid. Mixer drives and wetted parts are exposed to corrosive liquids and vapors that degrade rotating equipment. The crystallized gypsum and other material in low velocity zones in each vessel begin to adhere to vessel walls and impeller surfaces, reducing tank volumes. Accumulations can become large enough to break off and destroy impellers, shafts or mixer drives with sudden shock loads. The result is an inefficient mixing process with uncertain raw material yields and chronic equipment failures.

INEFFICIENT MIXING PROCESS

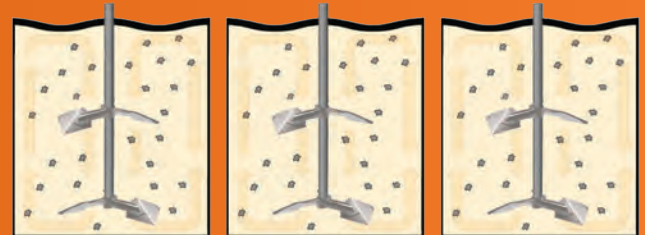


STARTUP

12 MONTHS

18 MONTHS

OUR OPTIMIZED MIXING PROCESS



STARTUP

5 YEARS

11 YEARS



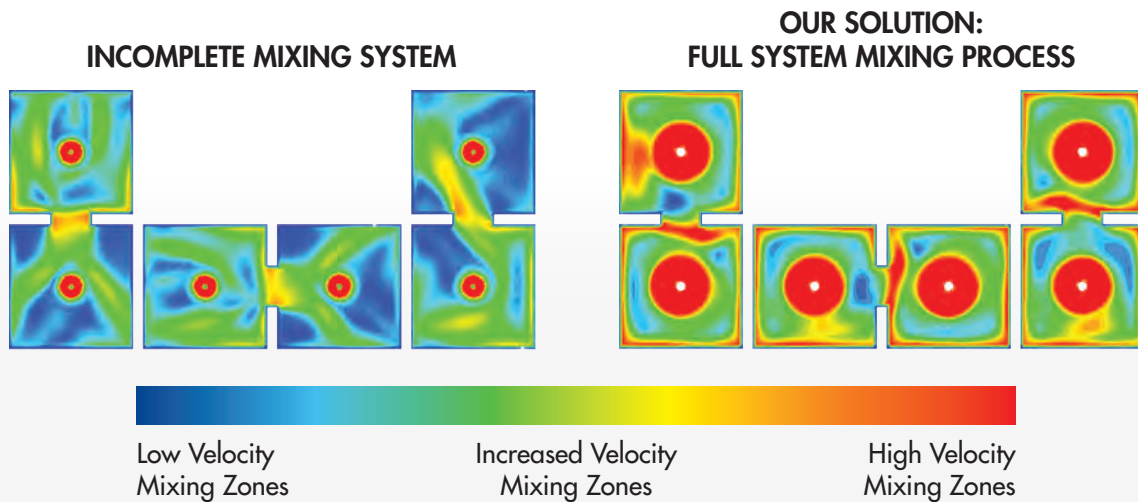
CRYSTALLIZED GYPSUM & OTHER MATERIAL

PVE Series Drive



THE PROCESS SOLUTION

The best mixing solution for phosphoric acid production involves modeling a full system mixing process that both eliminates dead zones and reduces zones of high sulfate concentration in reactor tanks. These zones are caused by incomplete mixing at the walls of the tanks that encourage particle agglomeration. As particles grow in size they adhere to vessel walls, impellers and shafts. By improving active mixing at the margins of the tanks, agglomeration is minimized. The phosphate rock has a larger surface area to react to the acid. This increases raw material yields and improves the overall yield and profitability of the plant.



THE MECHANICAL SOLUTION

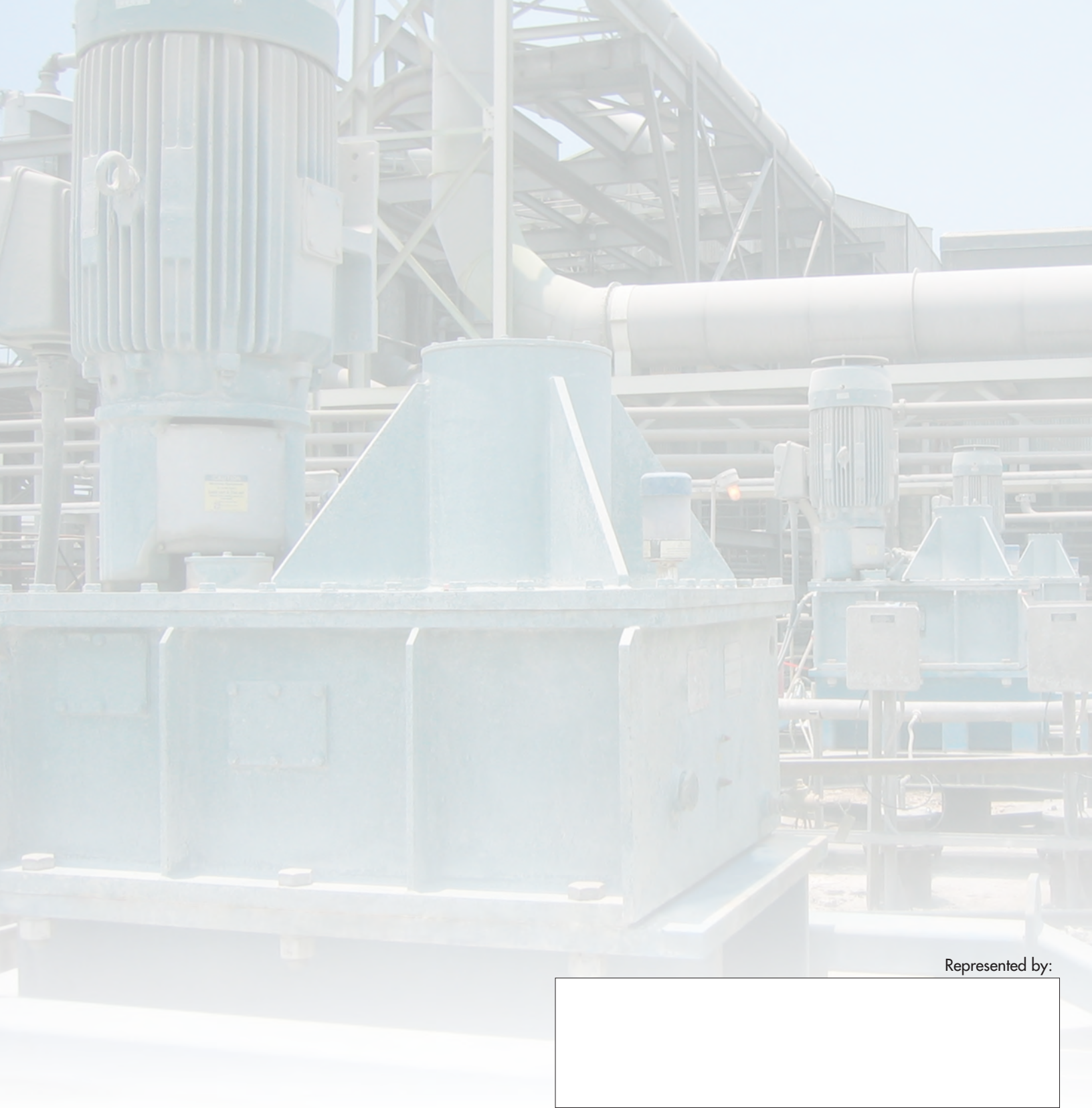
The ability to improve in-tank mixing early in the process is critical to improving the mechanical reliability of reactor mixers. The performance of our purpose-designed impellers, mechanical design criteria, and rigid coupling designs continue to withstand the test of time. Our success is no accident. Our process performance eliminates the root causes that lead to failures.

We have developed an industry standard mixer drive—The “Rock” (PVE Series)—to operate in the abusive phosphoric mixing process tanks. The drive has extra heavy duty bearings, seals and increased output shaft diameters to resist corrosion and withstand shock loads caused by the impact of phosphoric rock during blending operations. Drive housings have been designed with increased rigidity to keep the bearings and gearing in proper alignment in high shock load applications for long life service.

Our purpose-built PVE Series drives have been in continuous phosphoric acid production service since 2004 and can be deployed new or retrofitted worldwide through our production facilities in the United States or United Kingdom.



**MHS Impeller
(PhosAcid Specific)**



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