



Desktop Metal.

[Case Study]

# PGV Industries

[www.desktopmetal.com](http://www.desktopmetal.com)

# PGV INDUSTRIES



## Overview

Based in Karnes City, Texas, PGV has more than three decades of experience manufacturing equipment for the oil and gas, aerospace and robotics and automation industries. Along with traditional manufacturing via CNC machining, the company is now moving into next-generation manufacturing by integrating production-level metal 3D printing into their capabilities.

# 01 The Challenge

After more than three decades manufacturing parts using traditional methods - particularly CNC machining - for a wide range of customers, PGV is very familiar with the challenges manufacturers face:

## **Tooling Costs & Lead Time**

Traditional volume manufacturing - whether machining, casting or forging - requires “hard” tooling and fixturing which often costs tens of thousands of dollars and weeks or months to fabricate.

## **Lack of Agility**

Beyond cost and lead times, though, the need to fabricate tooling can have significant impacts on a company’s ability to quickly respond to new or changing customer requirements. With these constraints, manufacturers often struggle to quickly respond to new or changing customer requirements, and as a result, changing part designs become a daunting proposition.

For many of the same reasons, iterating on existing designs can be equally challenging. While many companies may print prototypes in plastic, those parts can only be used to test form and fit - functional testing requires creating metal parts, a process that is both expensive and time-consuming.

## **Inventory Management**

The long lead times needed for traditional manufacturing also create challenges for inventory management. Providing customers with spare or replacement parts in a timely fashion requires manufacturers to warehouse and track vast inventories of parts, in addition to the tooling and fixturing required to produce them.

With the growth of metal 3D printing in recent years - both in its abilities to create complex, end-use parts and its adoption by industry - PGV saw in the technology a way to address each of those challenges.

And in the Desktop Metal Shop System, they found the ideal system to do it.

## 02

## The Shop System Solution

Though it was installed less than a year ago, the Shop System's impact at PGV has been undeniable.

In addition to reducing costs and lead times, the system has enabled PGV to grow its business by freeing up internal production capacity and simplified inventory management - all of which add up to more agile, efficient operations.

Business Growth:

### Expanded business & services

The increased speed of production enabled by the Shop System allows PGV to be far more agile, taking on small- to medium-sized jobs that might previously have been no bid due to high tooling costs and long lead times.

While it would normally take as many as five processes to machine some down hole tools, the Shop System dramatically simplifies the process, freeing up PGV's internal machine shop to take on other jobs.

The lack of tooling also makes it easy for PGV customers to keep pace with the ever-changing world. With no need for tooling, the company can quickly update part designs to meet customers' evolving needs or create new designs without the long delays associated with traditional manufacturing.

The system allows the company to create parts, test them under real-world conditions, then iterate on designs based on the results, and do it all in less time than it would take to create traditional, hard tooling.

Business Operations:

### Reduced physical inventory by 50%

By opening the door to on-demand production of parts, the Shop System allowed PGV to reduce their parts inventory by as much as 50 percent. Rather than warehousing and tracking large numbers of parts, designs can be stored in "digital warehouses," and be retrieved and printed only when needed.

Time Savings:

### **Reduced lead times by 50–80%**

With the transition from machining to binder jetting, the company saw similar reductions in lead times. Jobs that had once required as many as 5 unique machining steps were reduced to just a single step. Depending on the part, lead times were cut by anywhere from 50 percent to as much as 80 percent.

## 03

# Why Desktop Metal?

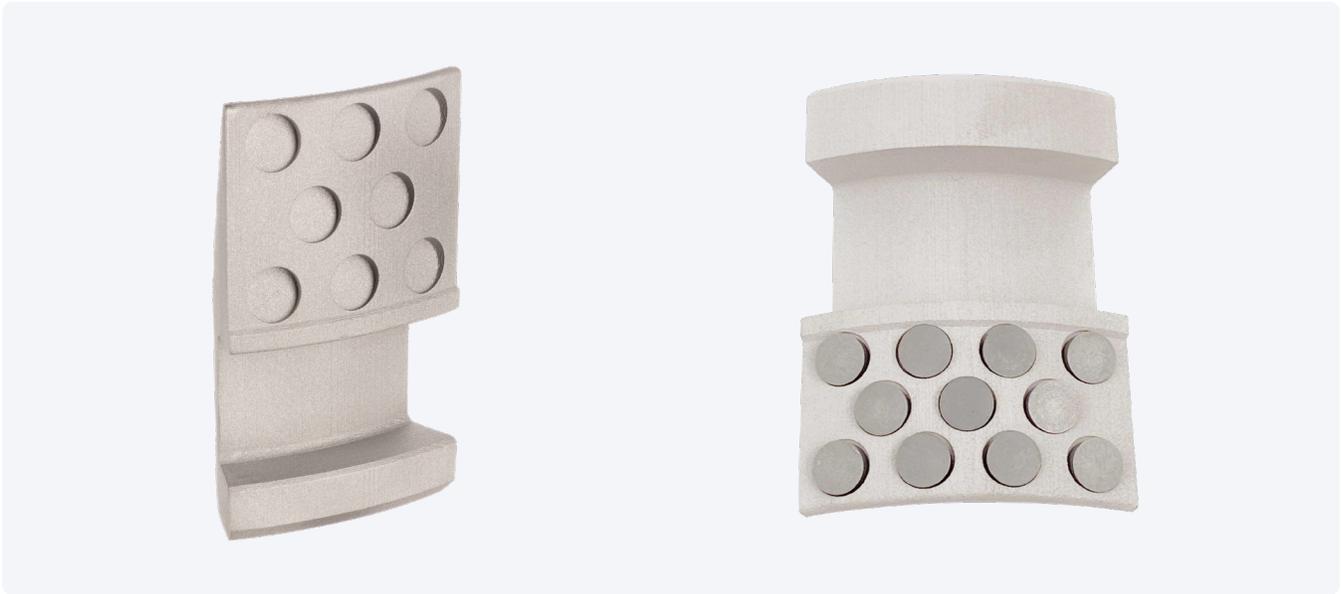
As part of their desire to incorporate next-generation manufacturing into their shop, PGV explored a wide range of metal 3D printing options, and chose the Shop System based on extensive benchmarking and testing.

Among the key factors for the company were the excellent material properties displayed by Shop System parts. In key characteristics like strength, ductility and hardness, parts produced on the Shop System meet or exceed those of traditionally-manufactured parts, ensuring they can stand up to the tough conditions they'll face in downhole operations.

The print quality of Shop System parts means PGV rarely needs to post-process parts - they can go straight from the furnace to end-use applications in the field.

Cost - particularly per-part cost - was also an important consideration. By eliminating the need for tooling, the Shop System helps PGV to realize thousands in savings in tooling costs, while still delivering high-quality, end-use parts.

## Part Fabrication &amp; Comparison



## Downhole Tool Slip

These slip parts are key components in a production packer used in oil and gas extraction. After being lowered into place, the wedge-shaped slips are pressed into place, causing the “buttons” on the face of the slip to bite into the inside casing of the well, forming a tight grip so the tool won’t release or move while under pressure.

Once in place, tools slips can face intense pressure, so it was critical these parts be strong enough to withstand those forces. The excellent material properties of Shop System parts ensured these tool slips are able to perform under real-world conditions.

Because the Shop System eliminates the need for tooling, PGV is able to manufacture these slips in far less time than it would take to machine the parts, allowing the company to dramatically reduce their inventory of spare parts.

The company is also able to easily adjust the design of this part to suit different scenarios, and send the new design into production without delays.

## Part Fabrication & Comparison



## Two-Part Tool Slip

A specialty item, these tool slips would typically be machined, a time-consuming and labor-intensive process given their two-part design.

Using the Shop System, PGV was able to drastically cut the lead time needed to produce both parts, allowing the company to significantly reduce their on-the-shelf inventory.

That ability to effectively print parts on demand allows PGV to instead store part designs in “digital warehouses,” and call them up for printing only when needed.



## Tubing Anchor

Used on pump jack wells, these tubing anchors are used to prevent tubing from moving during oil extraction, and are typically machined, a labor-intensive process that requires as many as five different set ups.

Using the Shop System, however, PGV is able to print the parts in a single step, saving significant lead time, allowing the company to dramatically reduce their need for on-the-shelf parts inventory.

Using the Shop System to produce these parts also frees up the company’s internal machine shop to take on other production jobs.

## Part Fabrication & Comparison



## Tool Slip (left) and Piston (right)

To justify the expense of producing these parts, which are typically cast or machined, PGV must manufacture them in relatively large quantities, then warehouse the parts.

With the Shop System, however, the company is able to produce significantly smaller quantities - in some cases fewer than 20 at a time - resulting in significant savings in both manufacturing and warehousing costs.

The other key consideration for these parts is strength to ensure they can withstand the high pressures inside wells. For a number of material properties - including strength - parts created on the Shop System meet harsh downhole oilfield requirements, ensuring they can withstand real-world conditions.

## Part Fabrication &amp; Comparison



## Tool Slip (left) and Ring (right)

Though they're still used by a small number of customers, the low demand for these parts meant PGV could no longer justify maintaining an inventory of replacement parts.

Using the Shop System, however, the company can quickly and easily manufacture these parts on demand, even in extremely low volumes.

The Shop System also simplifies the production of the ring component, which features a beveled inner diameter.

Though difficult to accurately produce using traditional manufacturing, the geometry can easily be created with additive manufacturing, allowing PGV to easily and accurately manufacture the part.

## 04 Evaluation

The Shop System allowed the company to save time by eliminating multiple CNC machining steps and man hours for many parts, and to significantly reduce lead times - in some cases by as much as 50 percent.

Speeding up the production of some parts also allowed the company to dramatically reduce it's on-the-shelf inventory - up to 50 percent for certain parts - resulting in savings on warehousing costs.

By turning over production of some parts to the Shop System, PGV is also able to free up capacity in their internal machine shop to take on other production jobs, expanding the company's capabilities.

## About Desktop Metal Inc.

Desktop Metal, Inc. is accelerating the transformation of manufacturing with end-to-end metal 3D printing solutions. Founded in 2015 by leaders in advanced manufacturing, metallurgy, and robotics, the company is addressing the unmet challenges of speed, cost, and quality to make metal 3D printing an essential tool for engineers and manufacturers around the world. In 2017, the company was selected as one of the world's 30 most promising Technology Pioneers by the World Economic Forum, and was recently named to MIT Technology Review's list of 50 Smartest Companies. For more information, visit [www.desktopmetal.com](http://www.desktopmetal.com).

## About PGV Industries

Founded in 1983, PGV is a leading manufacturer of parts and equipment for the oil and gas, aerospace and medical industries. In addition to traditional manufacturing via CNC machining, the company offers next-generation solutions with production-level metal 3D printing. Using metal 3D printing, PGV is helping customers achieve faster production while reducing design times for new products and optimizing the performance of older products with 3D printing.