Introduction
In a business where reliability and efficiency are paramount, the CPC Group is proud to have more than 100 years combined experience in the manufacturing of over 1,000 state-of-the-art casting machines. We provide our customers with the expertise of 500 highly skilled engineers, technicians and machinists who create, build and maintain the best in mass production technology and machinery operating around the world.

Counter pressure technology is being used by nearly every major automobile manufacturer in the world for chassis components and those that aren’t, soon will be. Because of the many advantages CPC technology provides, it is also the number one choice for any aluminum castings where high strength, reliability and cost are factors. We have many customers in the automotive, motorcycle, marine and electrical industries that lead the world in production and require the superior quality products only CPC can supply.

CPC Europe, CPC USA & CPC Asia
CPC Europe (Group headquarters), CPC USA and CPC Asia form the principle network of worldwide sales, service and operations. With locations around the globe, we can ensure our customers receive fast and reliable service anywhere in the world.

Ilinden Ltd
Ilinden Ltd. is a key member and the principal equipment manufacturing unit of the CPC Group. With decades of experience in the production of counter pressure casting, low pressure casting and gravity casting machines, as well as supporting equipment, Ilinden Ltd. has become a global leader in the industry with 98 percent of its business export.

Ilinden’s mold division is a one-stop shop for design, engineering, testing and development of counter pressure technology. A market specialist in mold manufacturing, Ilinden delivers the highest quality molds for CPC machines as well as high and low pressure dies and tooling.

CPC-Ceramics
The CPC Group’s Ceramics division has been developing Aluminum Titanate (AlTi) products for the foundry industry for over 20 years, including many used in our counter and low pressure casting machines. We can meet the needs of the most demanding customers by offering quality, selection and value for their investment.
Counter Pressure Casting Technology

For the past 15 years, CPC Group has been developing its technology, casting machinery and resources to be specifically tailored to the automotive chassis components market. The challenge has been to find an economical and dependable means of production in an industry where safety and reliability are critical. Counter Pressure Casting (CPC) is an innovative process that combines economy with highly reliable mass production technology to manufacture superior quality parts.

Process

There are many problems to watch for in other conventional aluminum casting processes such as low pressure, vacuum pressure, sand and squeeze casting. There is the chance of turbulent metal flow, the introduction of gases during filling and solidification porosity which contribute to the weakening of the casting’s structural integrity. These problems are virtually eliminated and controlled by CPC to provide castings of superior strength and reliability.

CPC uses two separate pressure chambers. The process begins by equally pressurizing both the furnace and the mold chambers. The pressure in the furnace is increased while the pressure in the mold chamber is released. (The pressure differential is usually between 300 to 1,000 mbar) This allows the melt to rise in the filling tube(s) with constant counter pressure on the melt’s surface. The filling process is non-turbulent and allows for better control and uniformity. The continuous counter pressure on the casting chamber also prevents the introduction of gases that normally occurs during filling in other processes. Solidification is controlled by using air or water for directional cooling. At the beginning of casting solidification, increased pressure is applied in the furnace chamber to achieve maximum feeding to areas prone to shrinkage. This ensures dimensional repeatability and increases the casting’s metal density. The constant pressure suppresses gases that would normally cause defects in the casting. Up to 6 bar of pressure may be applied without any risks to safety by using the closed-chamber system. When the casting has cooled, the pressure is quickly released in both chambers and the process is repeated.

Economic Benefits

In addition to its technical advantages, CPC has a number of economic benefits:

• The initial investment cost is extremely low relative to its exceptional return.
• The short learning curve and low complexity make the process easy to integrate into any existing production.
• An impressive yield of 95 percent or more is achieved by utilizing the most of the material.

Application

CPC is ideal for products that require a high strength-to-stress ratio to ensure safety and reliability. A perfect application would be chassis parts where high mechanical properties and ductility are needed in a very stable repeatable process, such as:

• Front and Rear Steering Knuckles/Spindles
• Upper and Lower Control Arms
• Subframes
• Front & Rear Crossmembers
• Structural Brackets
• Yokes
• Shock Towers

Results

Defects in casting reduce both its strength and structural integrity. With CPC’s ability to control metal flow in a tranquil fashion, a more uniform microstructure is attained. Using counter pressure during the entire process helps prevent the introduction of gases and porosity. Another advantage is lower variability in elongation and strength in the squeeze, vacuum pressure and sand casting. CPC can achieve elongation of 14 percent. Other processes show nearly twice that variability in their results.

Comparison of Casting Processes A356-T6

<table>
<thead>
<tr>
<th>Casting Process</th>
<th>UTS (MPa)</th>
<th>UTS (KSI)</th>
<th>UY (KSI)</th>
<th>Yield (%)</th>
<th>Elongation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand cast with chills</td>
<td>338±13</td>
<td>49±1.9</td>
<td>263±17</td>
<td>38±2.5</td>
<td>10.0±2.2</td>
</tr>
<tr>
<td>Vacuum-pressure casting</td>
<td>323±9</td>
<td>46.9±1.3</td>
<td>243±13</td>
<td>35±1.9</td>
<td>11.3±2.4</td>
</tr>
<tr>
<td>Squeeze casting</td>
<td>312±14</td>
<td>45.3±2.1</td>
<td>243±12</td>
<td>35±1.8</td>
<td>10.98±3.3</td>
</tr>
<tr>
<td>Counter pressure casting</td>
<td>334±4</td>
<td>48.5±0.6</td>
<td>239±5</td>
<td>35±1.5</td>
<td>14.3±1.5</td>
</tr>
</tbody>
</table>

The Changes in Pressure During The Casting Cycle

Step 1: Mold Chamber closes and casting cycle begins.
Step 2: Furnace and Mold chambers are pressurized equally.
Step 3: Pressure is increased in the Furnace chamber, melt begins to fill the mold cavity. Counter Pressure is continually applied in the mold chamber.
Step 4: Casting solidified under counter pressure using directional air/water cooling.
Step 5: Equalization of pressure between both chambers (∆P=0), melt returns to furnace.
Step 6: Mold chamber is opened and casting is ejected.
CPC 1600 C96

CPC developed the 1600 C96 casting machine for the ultimate in high strength chassis parts production. With the ability to cast up to 6 cavities producing up to 12 parts per cycle, minimal cycle times, and our revolutionary counter pressure technology, this is the most advanced combination of technology and equipment on the market today. It is the largest machine ever built by CPC and has surpassed the expectations of today’s OEM manufacturers. The CPC 1600 C96 is unmatched in the industry and provides our customers with production advantages on multiple levels they won’t find anywhere else.

CPC 1500 C64

The CPC 1500 C64 was developed exclusively for high strength structural parts production. With extremely fast cycle times, revolutionary counter pressure technology, and the ability to cast up to 4 cavities, up to 8 parts at once, this is one of the most advanced pieces of equipment CPC offers. Our customers are using this technology to cast high strength structural critical parts for nearly every major automobile manufacturer around the world.
CPC 1300 C12

Counter Pressure Casting (CPC/LPC) 1300 machines have been developed to utilize the counter pressure casting and low pressure casting process. Our equipment produces castings that exceed the highest requirements for mechanical properties, structural strength, density, surface smoothness, and dimensional accuracy. Each machine is designed to control all parameters of the CPC/LPC process while providing simple and reliable operation with minimum maintenance.

With the ability to operate in counter pressure or low pressure mode, the CPC 1303 is the most versatile machine available on the market.

LPC 1300 C12

Our Low Pressure Casting Machine (LPC) uses the same great design as its brother, the counter pressure casting machine (CPC), the same high quality materials, brand named equipment and a similar operating control system. Operators can be easily exchanged from our CPC system to the LPC machine and those who don’t need the sophistication of counter pressure still get the same great original design.

Mold Testing, Development & Production

Ilinden’s mold division is a one-stop shop for design, engineering, testing and development of counter pressure technology. A market specialist in mold manufacturing, Ilinden delivers the highest quality molds for CPC machines as well as high and low pressure dies and tooling.

With decades of experience in tool and die development, we use only the latest technology to provide our customers the advantages needed to be competitive in today’s market. Our design experts use the latest CATIA software for CAD/CAM 3D modeling. MAGMA simulation software is used to get an edge when design and optimization is key. All this is combined with our state-of-the-art mold manufacturing facility to make the highest quality tools and dies.

After production is complete, all of our dies are dimensionally checked for accuracy on dedicated Hexagon Metrology coordinate measuring machines. The last step and final check is real-world test casting and sampling in our casting facility.

At every step in the process, from concept to production, our mold development facility can meet the needs of even the most demanding customers.
Additional Equipment

A. Shuttle System
The shuttle system is the CPC Group’s original design and invention. It has been revolutionary in the industry, increasing efficiency and production. We created the shuttle with the idea of developing an integrated casting solution (not just simple casting machines) that improves every step in the process of making a good casting. Everything starts with our shuttle system which includes integrated degassing, holding stations and mold changing operations ensuring every step of our counter pressure casting process is controlled with maximum efficiency. Our shuttles can handle operations for a line of up to eight machines. With over 15 years’ experience, CPC is unmatched worldwide in performance and reliability.

B. Integrated Degassing Unit
Our degassing unit is fully integrated with our shuttle system and interchangeable holding furnaces.

The advantages of our rotary degassing process are:
- Shorter treatment time – 3 to 10 times faster than other degassing methods
- Higher quality alloy after treatment
- Less metal loss – 30 to 70 percent less dross than other methods
- Low operating costs
- Easy operation and maintenance

C. Quick Mold Change
The quick mold change carts are another great system CPC developed to make the process of changing molds simple and fast.

D. Automated Quench Tank
Our fully automated quench tank is directly integrated with our casting machines extraction manipulator. Quenching after casting increases mechanical properties and cools the casting for easy handling. The quench tank system is easily integrated with any of today’s major robotics manufacturers.

CPC-Ceramics

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- AlTi Riser tubes
- AlTi Bushings
- Degassing Baffle Plates
- Degassing Rotor & Shafts
- Thermocouples
- Furnace Bricks