Designs in Ductile Iron

COST SAVING DESIGN IDEAS
DUCTILE IRON, also known as nodular iron or S.G. iron, is a member of the family of cast irons, which includes gray, malleable, white, and compacted graphite irons. Although there are chemical and metallurgical differences that distinguish the family members, of prime concern to the design engineer are the mechanical and physical properties available. DUCTILE IRON is the strongest, the toughest, and has the highest endurance limit of all the cast irons.

Since the invention of DUCTILE IRON in 1948, DUCTILE IRON castings have been proven to be a reliable, cost effective alternative to steel castings, forgings, and fabrication. Conversions to DUCTILE IRON have been made because of excellent castability and machinability, comparable or superior properties, and 10% lower density resulting in cost savings as high as 75%.

Why DUCTILE IRON? Because it offers the design engineer an outstanding combination of endurance, toughness, reliability, and low cost manufacturing.
**Designs in Ductile Iron**

**CASTING**  
Stabilizer Foot

**APPLICATION**  
Support For Loader-Backhoe

**SPECIFICATION**  
ASTM A-536 (80-55-06)

**REDESIGN**  
From Steel Weldment

**COST SAVINGS**  
Reduce Costs 49%  
Annual Savings $80,000

**DESIGN ADVANTAGES**  
Eliminated Machining-Holes. They Were Cast to Size; All Fabrication Operations Eliminated

**SIZE & WEIGHT**  
Unknown

**COMPANY**  
Deere & Co.
Moline, IL

**FOUNDRY**  
John Deere Foundry  
East Moline, IL

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**CASTING**  
Rope Clamp and Eye Nut

**APPLICATION**  
Belt Conveyor

**SPECIFICATION**  
ASTM A-536 (65-45-12)

**REDESIGN**  
From Steel Forging

**COST SAVINGS**  
Part Cost Reduced 82%; $42,000 Annual Savings

**DESIGN ADVANTAGES**  
Produced Stronger Part; Improved Appearance

**SIZE & WEIGHT**  
1" x 2"

**COMPANY**  
Continental Conveyor & Equipment  
Winfield, AL

**FOUNDRY**  
Unknown

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**CASTING**  
Crankshaft

**APPLICATION**  
Supercharged Engine Component

**SPECIFICATION**  
ASTM A-897 
Austempered Ductile Iron

**REDESIGN**  
From Steel Forging

**COST SAVINGS**  
Costs Reduced 39%

**DESIGN ADVANTAGES**  
More Design Flexibility; Improved Sound Dampening; Better Wear Resistance; Stronger and Lighter Than Forging

**SIZE & WEIGHT**  
Unknown

**COMPANY**  
Ford Motor Co.

**FOUNDRY**  
Unknown

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**CASTING**  
Car Stop

**APPLICATION**  
Keeps Railcars From Moving Past a Designated Spot

**SPECIFICATION**  
ASTM A-536 (65-45-12)

**REDESIGN**  
From Steel Casting

**COST SAVINGS**  
Casting Cost Reduced Up to 25%

**DESIGN ADVANTAGES**  
Comparable Function; Improved Machinability

**SIZE & WEIGHT**  
Several Different Sizes

**COMPANY**  
Unknown

**FOUNDRY**  
Manitowoc Grey Iron Foundry  
Manitowoc, WI

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**DUCTILE IRON MARKETING GROUP**
## Designs in Ductile Iron

**CASTING**
- Tow Bar Head

**APPLICATION**
- Aircraft Tow Bar

**SPECIFICATION**
- ASTM A-536 (80-55-06)

**REDESIGN**
- From Steel Weldment

**COST SAVINGS**
- Part Cost Reduced 76%;
  - $94,000 Annual Savings

**DESIGN ADVANTAGES**
- Better Yield and Tensile Characteristics;
- Minimum Machining;
- Good Appearance

**SIZE & WEIGHT**
- 31” x 10” x 3”

**COMPANY**
- Wooland Aircraft Equipment
  - Miami, FL

**FOUNDRY**
- Golden’s Foundry & Machine
  - Columbus, GA

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**CASTING**
- Worm Gear & Post Screw

**APPLICATION**
- Pulp Refining Machinery

**SPECIFICATION**
- ASTM A-536 (60-40-18)

**REDESIGN**
- From Bronze & Steel Fabrication

**COST SAVINGS**
- Part Cost Reduced 46%;
  - $77 Savings per Unit

**DESIGN ADVANTAGES**
- Provided Precise Clearances Regardless of Internal Pressure;
  - Simplified Final Assembly

**SIZE & WEIGHT**
- Approximately 18” x 30”

**COMPANY**
- E. D. Jones Corp
  - Pittsfield, MA

**FOUNDRY**
- Unknown

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**CASTING**
- Wheel Hub

**APPLICATION**
- Four Wheel Drive All Terrain Vehicle

**SPECIFICATION**
- ASTM A-536 (65-45-12)

**REDESIGN**
- From Aluminum Casting

**COST SAVINGS**
- Part Cost Reduced 50%

**DESIGN ADVANTAGES**
- Lightweight; Increased Strength and Safety;
  - Pleasing Aesthetics

**SIZE & WEIGHT**
- Only 7 oz. Heavier than Previous Aluminum Part

**COMPANY**
- Dotson Company
  - Roseau, MN

**FOUNDRY**
- Unknown

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**CASTING**
- Fertilizer Knife

**APPLICATION**
- Fertilizer Injection

**SPECIFICATION**
- ASTM A897 Austempered Ductile Iron

**REDESIGN**
- From Forging and Weldment

**COST SAVINGS**
- Part Cost Reduced 44%

**DESIGN ADVANTAGES**
- All Components Can Be Made in the Casting:
  - Excellent Wear Characteristic;
  - Components Not Damaged in Service

**SIZE & WEIGHT**
- Est. 7 lbs.

**COMPANY**
- Unknown

**FOUNDRY**
- Hayes-Albion Corp
  - Albion, MI
Designs in Ductile Iron

CASTING: Nose and Mount
APPLICATION: Tension and Cut Stainless Steel Banding
SPECIFICATION: ASTM A-897 Austempered Ductile Iron-Investment Casting
REDESIGN: From Tool Steel Investment Casting
COST SAVINGS: Reduced 77% per Machine
DESIGN ADVANTAGES: Major Reduction in Machining Costs; Equivalent Performance and Wear Resistance; No Warping During Heat Treatment Allowing Machining to Be Done Before H.T.
SIZE & WEIGHT: Less Than 1 lb.
COMPANY: Panduit Corp.
FOUNDRY: Precision Metallurgical, Inc.
Markesan, WI

CASTING: Wire Rope Clamp
APPLICATION: Belt Conveyor
SPECIFICATION: ASTM A-536 (80-55-06)
REDESIGN: From Steel Forging
COST SAVINGS: Part Cost Reduced 92%; $42,000 Annual Savings
DESIGN ADVANTAGES: Provide Close Tolerances; Higher Strength; Marketing Advantages
SIZE & WEIGHT: Unknown
COMPANY: Modern Handling Systems
FOUNDRY: Unknown

CASTING: Anvil
APPLICATION: Blacksmith’s Forging Anvil
SPECIFICATION: ASTM A-536 (100-70-03)
REDESIGN: From Iron Casting with Tool Steel Plate Welded to Top Surface to Reduce Wear and Chipping
COST SAVINGS: Cost Reduced 35% per Piece
DESIGN ADVANTAGES: Good Response to Heat Treatment; Reduced Chipping on Corners; Better Looking Part; Eliminated Welding Operation
SIZE & WEIGHT: Est. 300 lbs.
COMPANY: Unknown
FOUNDRY: Fountain Foundry, Inc.
Pueblo, CO

CASTING: Door Mechanism Fixture
APPLICATION: Aircraft Bomber Door
SPECIFICATION: ASTM A-536 (65-45-12)
REDESIGN: From Steel Weldment
COST SAVINGS: Part Cost Reduced 78%
DESIGN ADVANTAGES: Solved Warpage Problem; Provided Strength; Reduced Number of Parts
SIZE & WEIGHT: Unknown
COMPANY: Field Aviation Co., Ltd.
FOUNDRY: Unknown
Designs in Ductile Iron

CASTING | Shift Lever
APPLICATION | Shifter For 4 x 4 Transfer Case
SPECIFICATION | SAE J-434C (D4512)
REDESIGN | From Weldment that was Reinforced with Multiple Stamping
COST SAVINGS | Greatly Reduced Price and Tooling Costs
DESIGN ADVANTAGES | Combined More Functions Into Casting; Improved Test Life; Better Shift Feel
SIZE & WEIGHT | 6" x 3"
COMPANY | Ford Motor Co.
FOUNDRY | Wagner Casting Decatur, IL

CASTING | U-Joint Slip Yoke
APPLICATION | Truck Drive Shaft Connector
SPECIFICATION | ASTM A-536 (100-70-03)
REDESIGN | From Steel Forging
COST SAVINGS | Cost Reduced 47%
DESIGN ADVANTAGES | Produced Reliable Part with Lower Machining and Material Costs
SIZE & WEIGHT | 18 lbs.
COMPANY | Dana Corp.
FOUNDRY | Dana Corp. New Castle, IN

CASTING | Brake Anchor
APPLICATION | Agricultural Tractor
SPECIFICATION | ASTM A-536 (80-55-06)
REDESIGN | From Steel Fabrication
COST SAVINGS | Part Cost Reduced 44%
DESIGN ADVANTAGES | Withstood High Impact Force; Minimized Machining Costs
SIZE & WEIGHT | 3" x 6"
COMPANY | John Deere Tractor Works Dubuque, IA
FOUNDRY | John Deere Foundry Moline, IL

CASTING | Air Compressor Block
APPLICATION | Multi-Stage Compressor
SPECIFICATION | ASTM A-536 (65-45-12)
REDESIGN | From Steel Weldment
COST SAVINGS | Part Cost Reduced 46%; $93,000 Annual Savings
DESIGN ADVANTAGES | Improved Sound Dampening and Product Integrity; Reduced Mfg. Operations; Better Appearance
SIZE & WEIGHT | 36" x 48"
COMPANY | Worthington Corp. Buffalo, NY
FOUNDRY | Unknown
Designs in Ductile Iron

CASTING: Steering Knuckle
APPLICATION: Automotive Steering Unit
SPECIFICATION: ASTM A-536 (60-40-18)
REDESIGN: From Forgings, Stamping, and Fasteners
COST SAVINGS: Substantial
DESIGN ADVANTAGES: Replaced Eleven Part Assembly; Improved Reliability
SIZE & WEIGHT: Approx. 12” Long; 17 lbs.
COMPANY: Cadillac Div. GM Detroit, MI
FOUNDRY: Central Foundry, GM Saginaw, MI

CASTING: Torque Spider & Brake Shoe
APPLICATION: Off-Highway Vehicle
SPECIFICATION: ASTM A-536 (60-40-18)
REDESIGN: NEW PART
COST SAVINGS: Unknown
DESIGN ADVANTAGES: Provided Rigidity Under High Load and Necessary Strength Under Critical Space Limitations
SIZE & WEIGHT: Approx. 20” Long
COMPANY: Bendix Corp. South Bend, IN
FOUNDRY: Sibley Machine & Foundry South Bend, IN

CASTING: Photometer Housing
APPLICATION: Clinical Analyzer
SPECIFICATION: ASTM A-536 (65-45-12)
REDESIGN: From Cold Rolled Steel
COST SAVINGS: Part Cost Reduced 45%; Saved $250 Per Unit
DESIGN ADVANTAGES: Weight Reduction; Improved Appearance; Greater Flexibility of Design; Improved Operation
SIZE & WEIGHT: 10” x 16”; 30 lbs.
COMPANY: DuPont Wilmington, DE
FOUNDRY: Unknown

CASTING: Truck Cab Mount
APPLICATION: Cab-Over-Engine Truck Cab
SPECIFICATION: ASTM A-536 (80-55-06)
REDESIGN: From Welded and Bolted Assembly
COST SAVINGS: Part Cost Reduced 31%; $192,000 Annual Savings
DESIGN ADVANTAGES: Improved Fatigue Life; Two Castings Replaced 25 Weld Assemblies (34 Separate Piece Parts)
SIZE & WEIGHT: Unknown
COMPANY: Freightliner Corporation Hillsboro, OR
FOUNDRY: Unknown

DUCTILE IRON MARKETING GROUP
**Designs in Ductile Iron**

**CASTING**
- Valve Bonnet

**APPLICATION**
- Pressure Containment
- For High Temperature Valve

**SPECIFICATION**
- ASTM A-536 (80-55-06)

**REDESIGN**
- From Steel Barstock
  - Cost Reduced 19%

**ADVANTAGES**
- Reduced Weight;
- Ease of Machining

**SIZE & WEIGHT**
- Less than 1/2 lb.

**COMPANY**
- Unknown

**FOUNDRY**
- Foster Oil Field Co.
- Houston, TX

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**CASTING**
- Rocker Arm

**APPLICATION**
- Truck Axle Suspension

**SPECIFICATION**
- ASTM A-536 (80-55-06)

**REDESIGN**
- From Forged & Welded Components
  - Part Cost Reduced
    - 62%; $1,000,000
    - Annual Savings

**ADVANTAGES**
- Provided High Shock Loads at Reduced Weight

**SIZE & WEIGHT**
- 55” x 5”; 98 lbs.

**COMPANY**
- Dura Corp.,
- Paris Products
- Paris, KY

**FOUNDRY**
- Lynchburg, Foundry
- Lynchburg, VA

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**CASTING**
- Diffuser Cone

**APPLICATION**
- Air Mixer For Oil Burner

**SPECIFICATION**
- Special Ductile Iron;
  - 5% Silicon + 1%
  - Molybdenum

**REDESIGN**
- From Stainless Steel Fabrication
  - 70% Reduction;
  - Operations Per Piece Reduced From 30 to 8

**ADVANTAGES**
- Longer Life due to High Temperature Properties

**SIZE & WEIGHT**
- Unknown

**COMPANY**
- Unknown

**FOUNDRY**
- Thompson Foundry LTD
- Surrey, B.C. Canada

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**CASTING**
- Body Bracket

**APPLICATION**
- Engine Support & Torque Reaction Member

**SPECIFICATION**
- SAE J-434C (D4512)

**REDESIGN**
- From Steel Stamping
  - Stiffer Design; 21%

**ADVANTAGES**
- Weight Reduction; More Compact Design Reduces Packaging and Body Interference Problems

**SIZE & WEIGHT**
- 7” x 2 1/2”

**COMPANY**
- Ford Motor Co.

**FOUNDRY**
- Wagner Castings
- Decatur, IL
**Designs in Ductile Iron**

**CASTING**
- Crop Box
- Cam
- Control Rod

**APPLICATION**
- Slab Line in Steel Mill
- Cotton Picker
- Percussion Air Drill

**SPECIFICATION**
- ASTM A-536 (60-40-18)
- SAE J-434C (D5506)
- ASTM A-536 (80-55-06)

**REDESIGN**
- From Steel Weldment
- From Hardened Tool Steel
- From Steel Weldment

**COST SAVINGS**
- Unknown, but Substantial
- Part Cost Reduced 68%; $450,000 Annual Savings
- Part Cost Reduced 64%; $61,000 Annual Savings

**DESIGN ADVANTAGES**
- Resisted Heavy Impact and Thermal Shock; Improved Service Life; Far Easier to Repair
- Reduced Surface Loads; Increased Picking Speeds; Improved Efficiency
- Better Field Performance; Eliminated Shrink Fit and Welding

**SIZE & WEIGHT**
- 5 Casting (12 Tons)
- Approx. 14"
- Unknown

**COMPANY**
- Planet Products
- John Deere
- Mission Mfg.

**FOUNDRY**
- Black Clawson Foundry
- John Deere
- Acme Foundry & Machine

**Ductile Iron Marketing Group**
**Designs in Ductile Iron**

**CASTING**
Drive Gear

**APPLICATION**
Tire Changer

**SPECIFICATION**
ASTM A-536 (80-55-06)

**REDESIGN**
From Machined Steel

**COST SAVINGS**
Part Cost Reduced 61%; $69,000 Annual Savings

**DESIGN ADVANTAGES**
Better Finish; Improved Dimensional Stability; Faster Processing

**SIZE & WEIGHT**
6" x 8"

**COMPANY**
Coats Co.
Ft. Dodge, IA

**FOUNDRY**
Chicago Hardware Foundry
North Chicago, IL

**CASTING**
Impression Cylinder

**APPLICATION**
Rotary Printing Press

**SPECIFICATION**
ASTM A-536 (65-45-12)

**REDESIGN**
From Steel Forging

**COST SAVINGS**
Part Cost Reduced 30%; $24,000 Annual Savings

**DESIGN ADVANTAGES**
Better Dampening Qualities; Reduced Machining; Eliminated Purchase of Special Machine Tool

**SIZE & WEIGHT**
Approx. 48" x 12"

**COMPANY**
Miehle Co.
Chicago, IL

**FOUNDRY**
Unknown

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**Designs in Ductile Iron**

**CASTING**
Baseplate

**APPLICATION**
Vibratory Compactor

**SPECIFICATION**
ASTM A-536 (65-45-12)

**REDESIGN**
From Steel Weldment and Two Castings

**COST SAVINGS**
Part Cost Reduced 28%; Plus Assembly and Labor

**DESIGN ADVANTAGES**
Reduced Weight; Increased Wear Resistance; Increased Oil Capacity for Excitor; Longer Life of Part

**SIZE & WEIGHT**
30, 40 and 50 cm in length; 90-110 lbs.

**COMPANY**
Wacker Corp.
Menomonee Falls, WI

**FOUNDRY**
Unknown

**CASTING**
Cross Member

**APPLICATION**
Truck

**SPECIFICATION**
ASTM A-536 (80-55-06)

**REDESIGN**
From Steel Weldment

**COST SAVINGS**
Part Cost Reduced 65%; $126,000 Annual Savings

**DESIGN ADVANTAGES**
Longevity Greatly Increased; Assembly Time Reduced

**SIZE & WEIGHT**
Approx. 35"; 133 lbs.

**COMPANY**
Cunha Products
Haywood, CA

**FOUNDRY**
Unknown

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**DUCTILE IRON MARKETING GROUP**

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**DUCTILE IRON MARKETING GROUP**

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Cost Savings Design Ideas

Designs in Ductile Iron

CASTING
Hydraulic Motor Rear Housing

APPLICATION
Allows Changing of Hydraulic Motor Displacement

SPECIFICATION
ASTM A-536 (80-55-06)

REDESIGN
Was a Three Piece Assembly of Steel Plate That Required a Considerable Amount of Machining

COST SAVINGS
Component Cost Reduced 44%

DESIGN
Improved Wear and Machining Characteristics; Cost Savings Provided Cost Competitiveness

ADVANTAGES
Machining Characteristics; Cost Savings Provided Cost Competitiveness

SIZE & WEIGHT
Approx. 100 lb. Casting

COMPANY
Rineer Hydraulics
San Antonio, TX

FOUNDRY
Alamo Iron Works
San Antonio, TX

CASTING
Lift Arm

APPLICATION
Raise & Lower Motor Grader Blade

SPECIFICATION
ASTM A-536 (65-45-12)

REDESIGN
From Steel Casting

COST SAVINGS
Part Cost Reduced 47%

DESIGN
Lower Manufacturing Costs

ADVANTAGES
Costs

SIZE & WEIGHT
Unknown

COMPANY
Caterpillar Inc.
Decatur, IL

FOUNDRY
Unknown

CASTING
Forward-Reverse Gear Housing

APPLICATION
Power Transmission Part

SPECIFICATION
ASTM A-536 (100-70-03)

REDESIGN
From Steel Forging, Steel Stamping, and Shaft

COST SAVINGS
$402,000 Annual Savings

ADVANTAGES
High Fatigue Strength; Good Response to Heat Treatment; Reduced Number of Parts; Reduced Operations from 18 to 9

SIZE & WEIGHT
6" Diameter Gear

COMPANY
Unknown

FOUNDRY
Dotson Company
Mankato, MN

CASTING
Syphon Elbow

APPLICATION
Condensate Removal From Paper Dryer

SPECIFICATION
ASTM A-536 (60-40-18) Investment Cast

REDESIGN
From Bronze

COST SAVINGS
Cost Reduced 10% Per Part

ADVANTAGES
Increased Strength; Reduced Machining Time

SIZE & WEIGHT
5 oz. to 2 lbs. 11 oz.

COMPANY
The Johnson Corp.
Three Rivers, MI

FOUNDRY
Unknown

DUCTILE IRON MARKETING GROUP

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DUCTILE IRON MARKETING GROUP

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Designs in Ductile Iron

CASTING: Gland
APPLICATION: Hydraulic Cylinder
SPECIFICATION: ASTM A-536 (65-45-12)
REDESIGN: From Gray Iron Casting
COST SAVINGS: Part Cost Reduced 66%; Reduced Operations from 10 to 3
DESIGN ADVANTAGES: Stronger; Quality is Improved; Better Machinability; More Economical
SIZE & WEIGHT: Variable
FOUNDRY: Unknown

CASTING: Clutch Cup
APPLICATION: Farm Tractor Power Take-Off
SPECIFICATION: ASTM A-536 (100-70-03)
REDESIGN: From Steel Forging
COST SAVINGS: Part Cost Reduced 32%; $112,000 Annual Savings
DESIGN ADVANTAGES: Substantial Cost Savings While Still Retaining Tensile and Yield Strengths
SIZE & WEIGHT: 6” x 5”
COMPANY: International Harvester
FOUNDRY: International Harvester

CASTING: Steering Column Support
APPLICATION: Support Steering Column; Absorb Air Bag and Crash Loads
SPECIFICATION: SAE J-434C (D4512)
REDESIGN: From Steel Weldments and Multiple Stampings
COST SAVINGS: Unknown
DESIGN ADVANTAGES: Stronger; Improved Performance Safety Related Part
SIZE & WEIGHT: 15” x 4”
COMPANY: Wagner Casting
FOUNDRY: Same as Above

CASTING: Air Suspension Hanger
APPLICATION: Converter Dolly
SPECIFICATION: ASTM A-536 (80-55-06)
REDESIGN: From Steel Weldment
COST SAVINGS: Part Cost Reduced 53%; $58,000 Annual Savings
DESIGN ADVANTAGES: Increased Service Life 10-15 Times; Decreased Assembly Time 83%; Eliminated Welding
SIZE & WEIGHT: Approx. 12”
COMPANY: Todco Div. Overhead Door

DUCTILE IRON MARKETING GROUP
Cost Saving Design Ideas

Designs in Ductile Iron

CASTING Plug Valves
APPLICATION Fluid Handling
SPECIFICATION ASTM A-536 (60-40-18)
REDESIGN From Stainless Steel, Titanium, Monel
COST SAVINGS Part Cost Reduced 66%; $3,000,000 Annual Savings
DESIGN ADVANTAGES Provided Close Dimensional Tolerances; Facilitated Installation of Plastic Liner
SIZE & WEIGHT Various
COMPANY Continental Mfg.
Cincinnati, OH
FOUNDRY Lynchburg Foundry
Lynchburg, VA

CASTING Rear Engine Mount
APPLICATION Engine Support and Torque Reaction Member
SPECIFICATION SAE J-434C (D4512)
REDESIGN From Steel Stamping
COST SAVINGS Lowered Tooling & Per Piece Costs
DESIGN ADVANTAGES Stiffer Design; 38%
SIZE & WEIGHT 5” x 4”
COMPANY Ford Motor Co.
FOUNDRY Wagner Casting
Decatur, IL

CASTING Tool Storage Index
APPLICATION N/C Machining Center
SPECIFICATION ASTM A-536 (80-55-06)
REDESIGN From Steel Weldment
COST SAVINGS Part Cost Reduced 80%
DESIGN ADVANTAGES Reduced Production Operations from 2,115 to 24; Improved Appearance
SIZE & WEIGHT Unknown
COMPANY National Automatic Tool
Richmond, IN
FOUNDRY Unknown

CASTING Crankcase
APPLICATION Air Compressor
SPECIFICATION ASTM A-536 (60-40-18)
REDESIGN From Steel Weldment
COST SAVINGS Part Cost Reduced 82%; $100,000 Annual Savings
DESIGN ADVANTAGES Better Resistance to Shock Damage; Improved Sound Dampening
SIZE & WEIGHT 48” x 36” x 72”
COMPANY Worthington Corp.
Harrison, NJ
FOUNDRY Unknown

DUCTILE IRON MARKETING GROUP