



CIRCLE OF FRIENDS
GMC
alumni

Rebuilding & Tuning the Olds 455/403

Improved Power, Torque and Reliability

Joe Mondello
Mondello Technical Center
Mondello Performance Products

Outline

- Introduction
- Advantages of Rebuilding
- Usual rebuilding Process
- Mondello Rebuilding Process
- Quality of components
- Reduce friction
- Reduce heat
- Advanced coatings
- Machining components
- Improve Breathing
- Advanced Lubrication
- Questions

Introduction

- Professional History
- California Facility
- Tennessee Facility
 - ♦ Head Porting
 - ♦ Cylinder Head Valve Work and Dry Flow Testing
 - ♦ Racing Engine Blue-printing
 - ♦ High-Performance Machining
- ♦ Track Tune Ups
- ♦ Tear Down, Inspection, Reassembly and Dyno Testing
- ♦ Motorcycle
- ♦ Diesel Head Porting and Design
- Future

Rebuilding & Tuning

- Increased Power
- Increased Torque
- Improved Reliability



Usual Rebuilding Process

- Magnaflux crank & rods
- Bore block
- Machine crankshaft
- Regrind camshaft
- Machined heads
- New pistons & rings
- New lifters
- New timing chain
- New main & rod bearings
- New freeze plugs
- New seals
- New gaskets
- New valves, guides & Springs
- New valve seats
- Rebuilt oil pump?
- New fuel pump?
- Rebuilt water pump?

Usual Rebuilding Process

- Magnaflux crank & rods
- Bore block
- Machine crankshaft
- Regrind camshaft
- Machined head
- New pistons & rings
- New lifters
- New timing chain
- New main & rod bearings
- New freeze plugs
- New seals
- New gaskets
- New valve guides & springs
- New valve seats
- Rebuilt oil pump?
- New fuel pump?
- Rebuilt water pump?

INADEQUATE

Mondello Rebuilding Process

- Disassemble
- Liquid Magnaflux all parts
- Take blocks, heads and crankshafts – stress-relief shake*

* Unique to Mondello

I of 8



Mondello Rebuilding Process

- Cryogenically freeze all engine components*
- Check all cam specs and crankshaft strokes with computerized equipment

* Unique to Mondello



Mondello Rebuilding Process

- Connecting rod lengths on computerized rod checker
- Crankshafts reground, nitrided, cross-drilled, shot-peened, and micro-polished
- Parts checked with micrometer: pistons, cranks and bearings
- All engine components are thoroughly balanced $\pm .5$ grams of related components
- All rings checked and end-gapped, deburred and hand-lapped.

Mondello Rebuilding Process

- Blocks bored on 4-access Sunnen V30 machining center; corrects bore centerlines missed by factory
- Lifter bore angles checked and corrected as needed



Mondello Rebuilding Process

- Blocks machined to correct cylinder deck flatness to $\pm .0005$ in all four corners to crank centerline
- Cylinder heads surfaced on all three sides...
 - ✦ intake
 - ✦ exhaust
 - ✦ head surface
- Cylinder heads; fill heat riser passages with zinc alloy
 - ✦ install bronze guideliners
 - ✦ replace all exhaust valve seats
 - ✦ all SS intake/exhaust valves
 - ✦ port intake/exhaust valve bowls
 - ✦ blend short-side radius
 - ✦ increases HP by ~25

Mondello Rebuilding Process

- Assembled with correct valve-stem lengths, done with 5-angle valve job on Serdi head center
 - ♦ Viton valve seals and silicon vinadium valve springs
 - ♦ Chromolly valve spring retainers and heat-treated valve locks



Mondello Rebuilding Process

- Cylinder heads and blocks de-burred inside and out; improved oil flow
- Stoned and polished as needed
- Complete engine internally blue-printed
- Camshafts degreed and end-play corrected
- Lifter preload set and measured with dial indicator
- Intake manifolds ported and matched to cylinder heads

Mondello Rebuilding Process

- Complete assembly of engine performed
- Run on NASCAR 902 dyno for break-in; one hour
- Power and torque figures given to customer
- Recommend fine-tuning after engine in coach

Inferior Components

- Inferiority of foreign parts
 - ✦ Pistons from India; some are OK
 - ✦ Hydraulic valve lifters and valves from China
 - ✦ Harmonic balancers from India
 - ✦ Cromolly retainers from China
 - ✦ Camshafts from China
 - ✦ Pistons of late are from China
 - ✦ Timing chain sets from China, India and Turkey

Quality Components

- Pistons – Keith Black and Arias Custom Pistons
- Valves – Manley or SI
- Valve Lifters – Johnson Highlift
- Roller Lifters – Morel
- Camshafts – Engle or Compcams
- Bearings – ACL or Clevite H-series Bearings (rods and mains)

Quality Components

- Cam Bearings – Dura-Bond Full Round
- Rings –
 - ✦ Speed Pro or Total Seal, Plasma Molyductile top rings
 - ✦ Napier second rings
 - ✦ Chrome stainless three-piece oil
- Chromoly push rods
- Cast steel or aluminum roller rocker arms
- Depending on level of rebuild, engine coatings used on many components

Quality Components

- On high-end 455 or 403 – three chromolly steel center main caps and halo support girdle

Halo support girdle



Reducing Friction

- Coatings
- Oil additives

Reducing Heat

- In addition to enlarging passages for oil flow
 - ✦ Coatings
 - ✦ Oil additives
 - ✦ Cam break-in
 - Proper procedures (see brochure)
 - Add cam shield cam and lifter paste
 - 4 ozs cam shield oil additive for break-in

Reducing Heat

- In addition to enlarging passages for oil flow
 - ✦ Coating combustion chambers and valves plus exhaust ports with high-heat, high-lubricity coating to eliminate carbon sticking



Advanced Coatings

- Pistons
 - ✦ Cermet (tops)
 - ✦ Molidium sulphite (skirts),
 - ✦ Heat oil-shedding coating (inside)
- Rods; oil-shedding coating
- Cams and lifters; high-pressure coating, enhance break-in
- Bearings – rods, mains and cam coated with molidium sulphite, high-pressure coating



Machining Improvements

- Line boring



Machining Improvements

- Line honing
 - ✦ Sunnen Model V10 Diamond Hone; torque plates used
 - ✦ Final honing for ring seal using Vitric stones
- Done with torque-cycled ARP fasteners
- Same head gaskets as final engine assembly



Improved Breathing

- K&N Air Cleaner
 - ✦ Cold air induction
 - ✦ Cylinder head porting
- Headers
 - ✦ Dougs/Mondello Tri-Y headers – use metallic ceramic heat coatings
 - ✦ First header for motorhome to be built on exhaust flange of 455 or 403
 - ✦ Features larger and thicker exhaust flange

Advanced Lubrication

- Today's oils and gasolines















Spring Rally
April 22-25
KOA
Calhoun, GA

**Mondello Technical Center
2470 Pomona Road
Crossville, Tennessee 38571**



**Mondello Performance Products
1103 Paso Robles Street
Paso Robles, CA 93446
(805) 237-8808**

Spring Rally
April 22-25
KOA
Calhoun, GA

