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?
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- Rebuilt water pump?
Mondello Rebuilding Process

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

* Unique to Mondello
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 ± .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 ± .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
  ✦ Doug's/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
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