

A detailed 3D CAD model of a V8 engine, likely a Magnesium MonoBloc V8, is shown in the background. The engine components are rendered in various colors: green for the pistons and connecting rods, blue for the intake manifold, and purple for the valve train. The engine is mounted on a gold-colored base. The text is overlaid on the top half of the image.

High Performance in a Downsized World?

DV8

A Magnesium MonoBloc V8 Engine

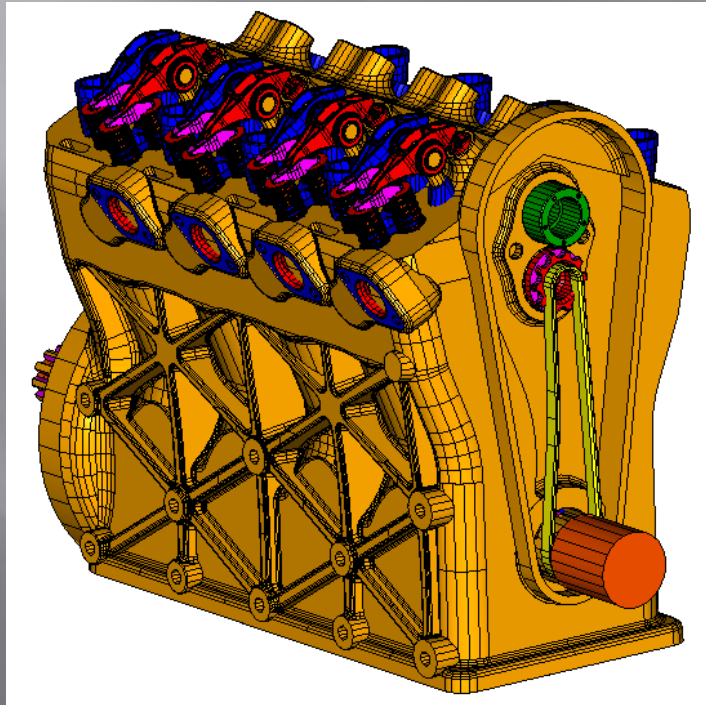
By

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Design Engineering Services, Inc.

October 26, 2011

*D***V**8 is a 45 degree SOHC 4 valve per cylinder V8 Turbo Diesel engine of 3.8 to 5.0 liter displacement with integrally cast individual cylinder head/liners



THE
LOWDOWN

PART COUNT



Is

a

Coaster

This

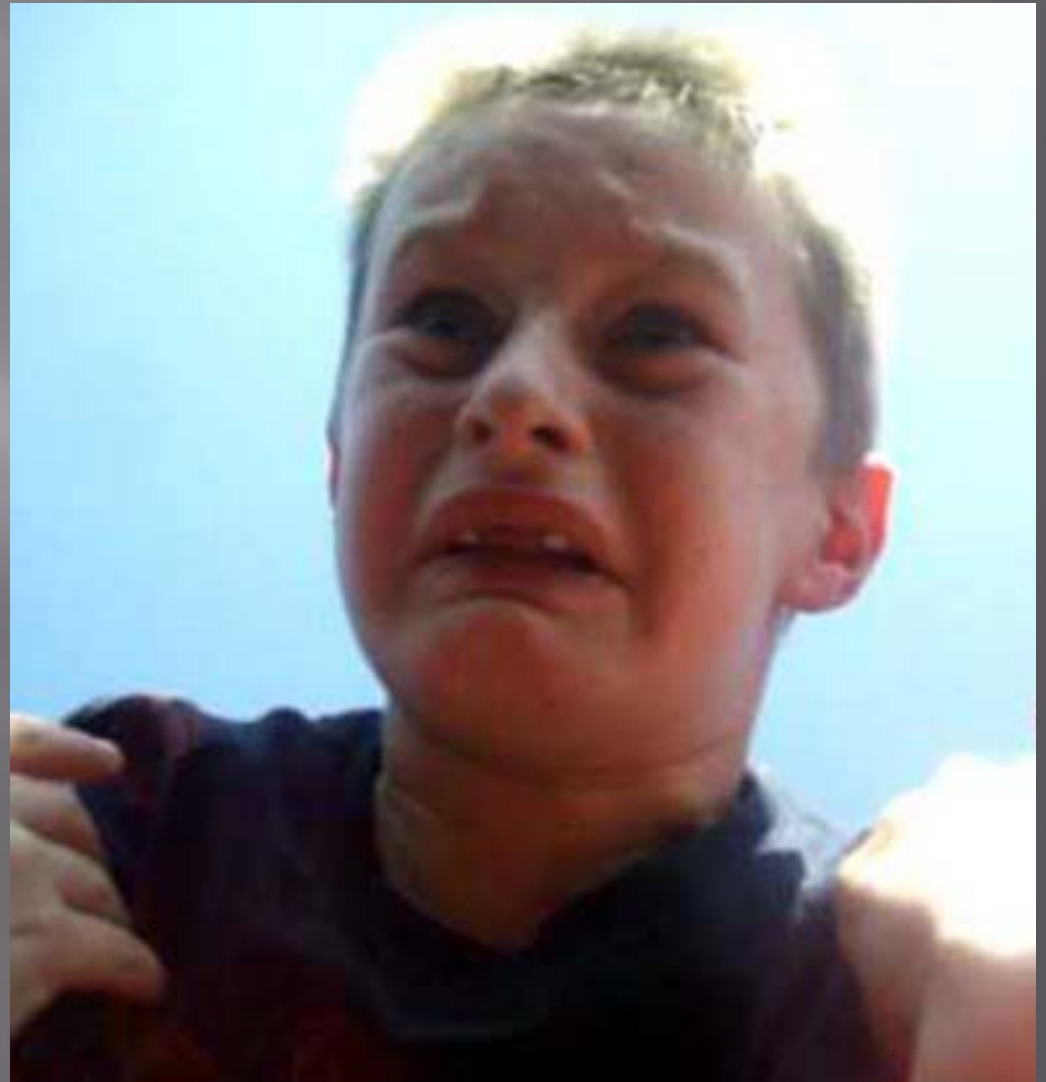
Roller

or

what!









P
E
R
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C
E



ASSEMBLY T I M E



COST



HIGH!

NO!

“NEVER SETTLE”

- *Steve Jobs*

DV8 is a design to go from

The Low Down

to

The High Ground...

What is The High Ground?

Package Efficiency -----> Low Vehicle Mass

What is The High Ground?

High Stiffness -----> High Durability

What is The High Ground?

High Precision -----> Low Friction

What is The High Ground?

Tight Tolerances -----> High Fuel Efficiency

What is The High Ground?

Parts Integration -----> Lower Assembly Cost

What is The High Ground?

No Head Gaskets?

What is The High Ground?

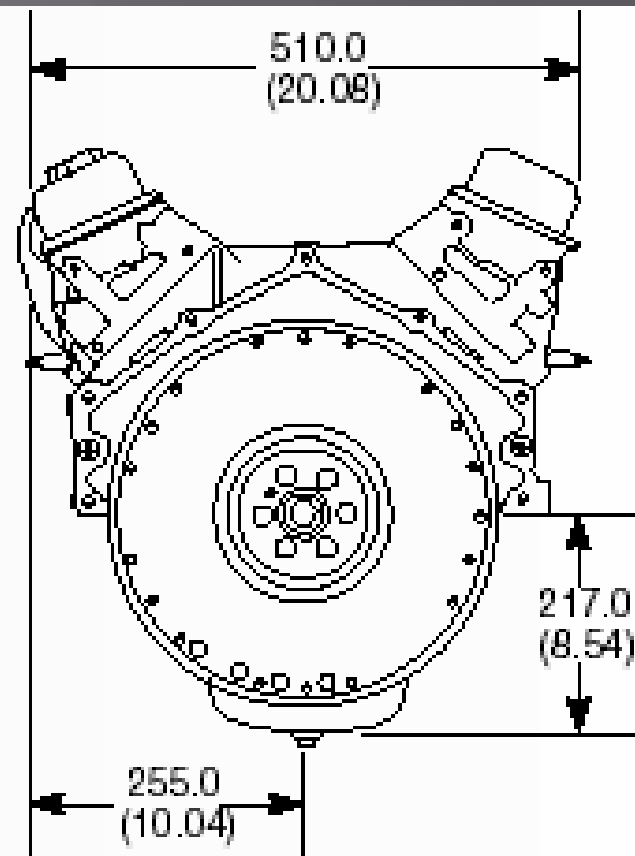
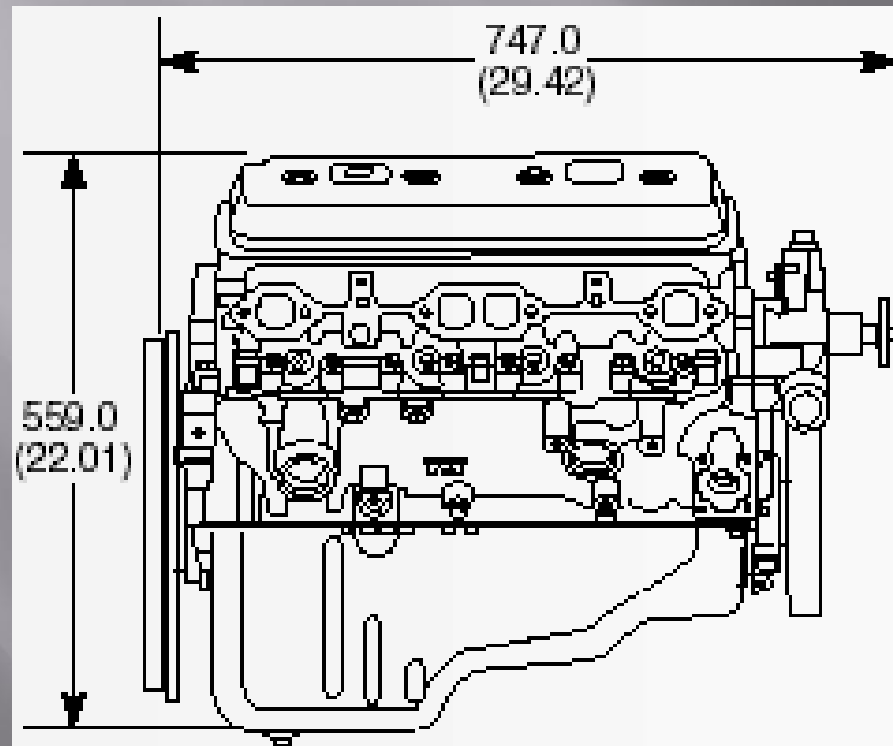
Priceless!

But
How to
Achieve
All This?

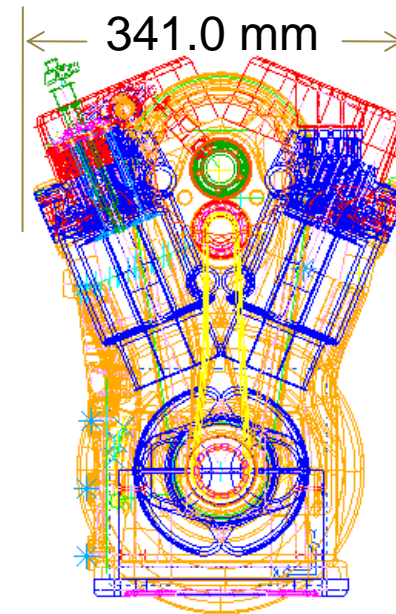
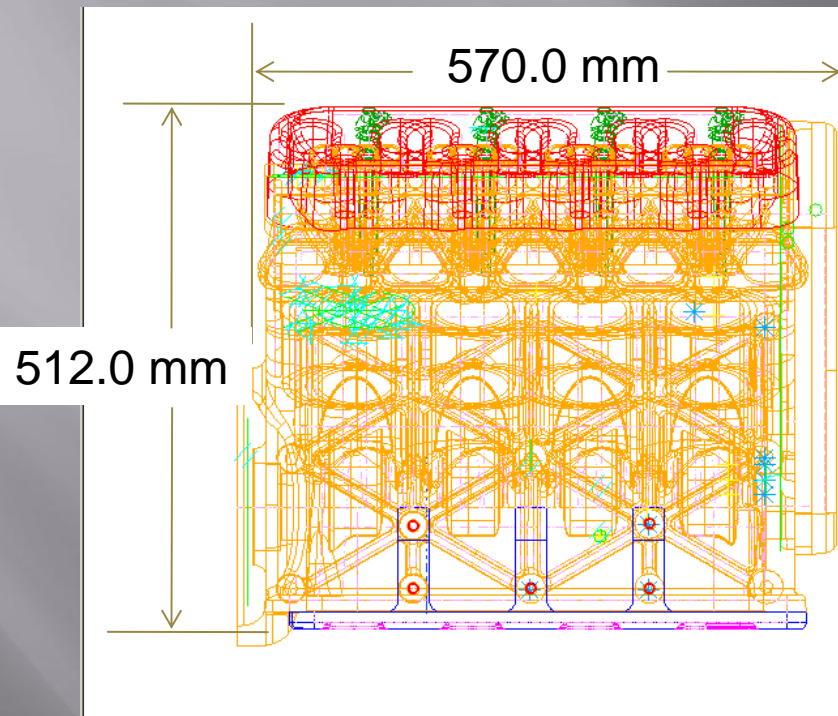
Cost Cost Cost!

- ▣ Material
- ▣ Machining
- ▣ Assembly

Small Block Chevy Compared to DV8



Small Block Chevy Compared to DV8



Why Magnesium?

- ▣ Its 30% lighter than Aluminum
- ▣ It can be die cast cost effectively
- ▣ It is 100% Recyclable
- ▣ It is 25% easier to machine vs. Aluminum

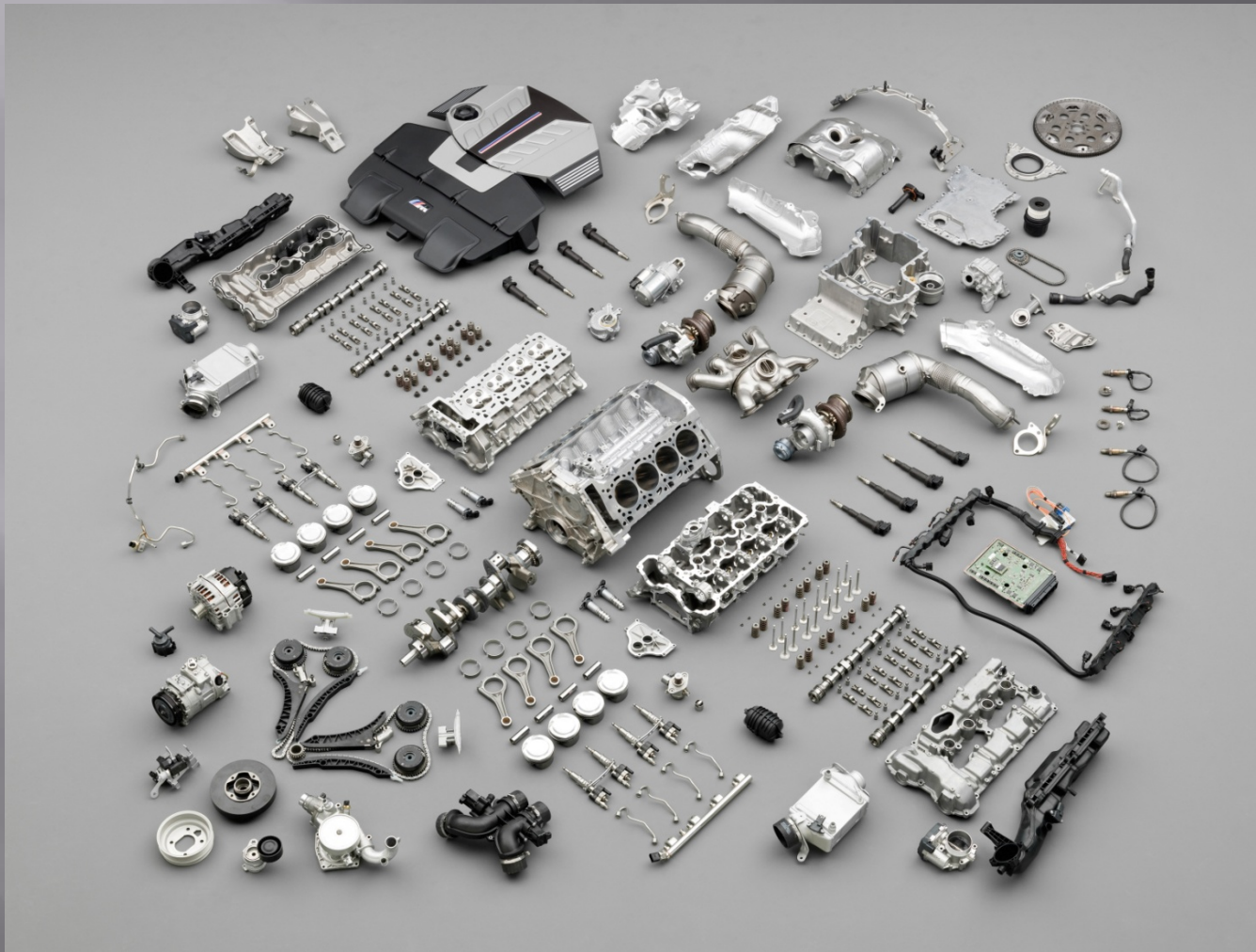
Why Not Magnesium?

- ▣ Fatigue strength at High temps
- ▣ Corrosion with antifreeze
- ▣ Higher raw material costs
- ▣ Challenging to properly Design & Engineer

It's not for the faint of heart!



Many of These Parts Would Fail



If Not Properly Designed...

So let's start with a Chevy
Small Block camshaft...



Goals for Lightness

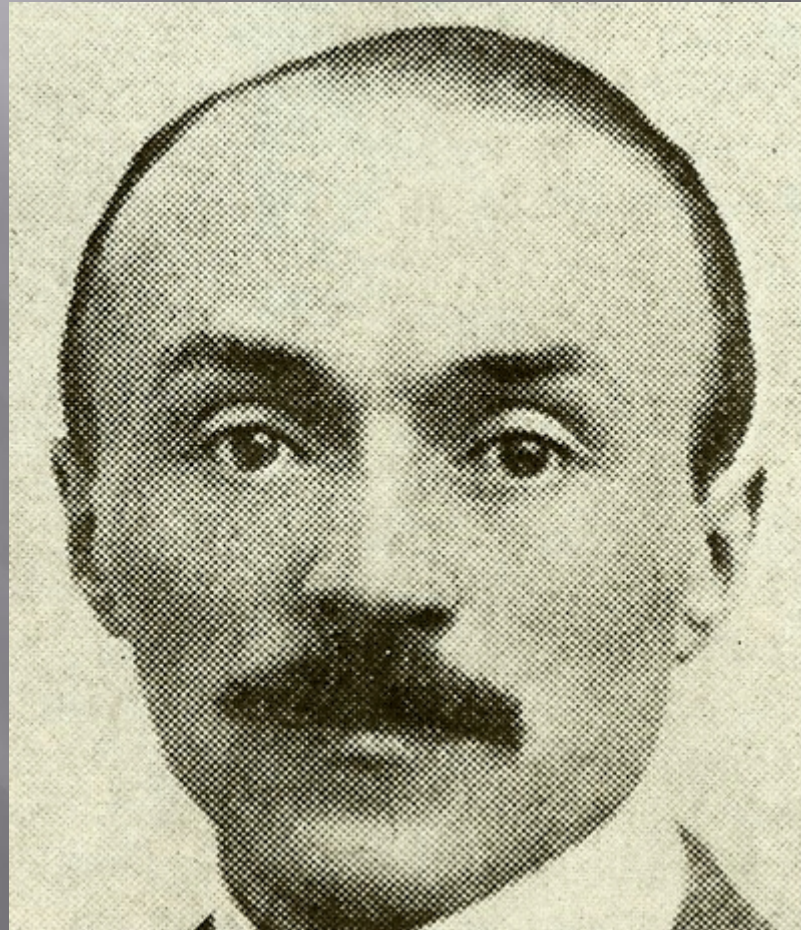
- ▣ Parts Integration for compounded stiffness
- ▣ Material selection for optimal utilization
- ▣ A stone reliable design that renders servicing unnecessary

When was the last time you rebuilt your engine vs. replacing it?

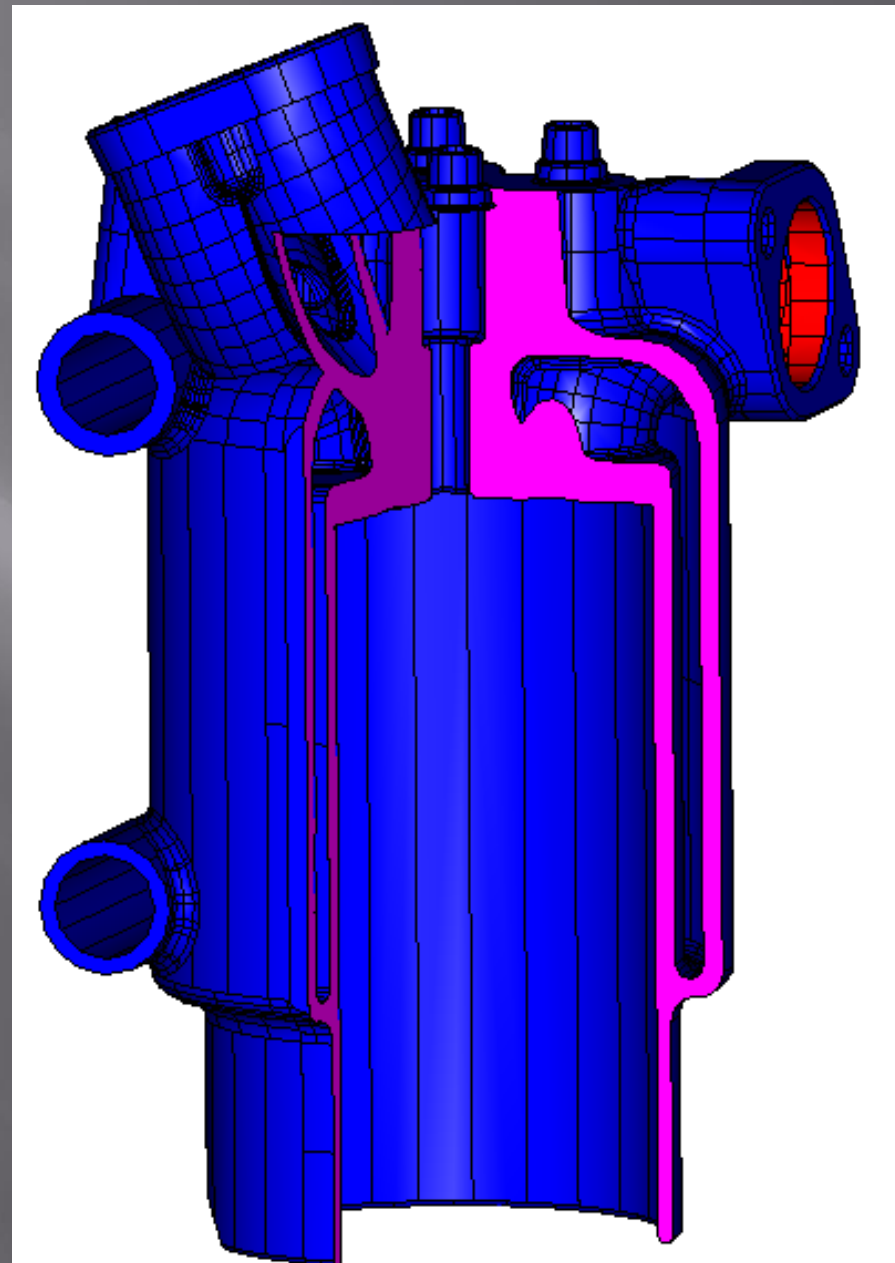
The Need for Less...

- ▣ Integrate The Following Functions:
 - Cylinder Head
 - Cylinder Liner
 - Valve Seats
 - Valve Guides
 - Rocker Mounts
 - Intake and Exhaust Ports
 - Cooling Jacket

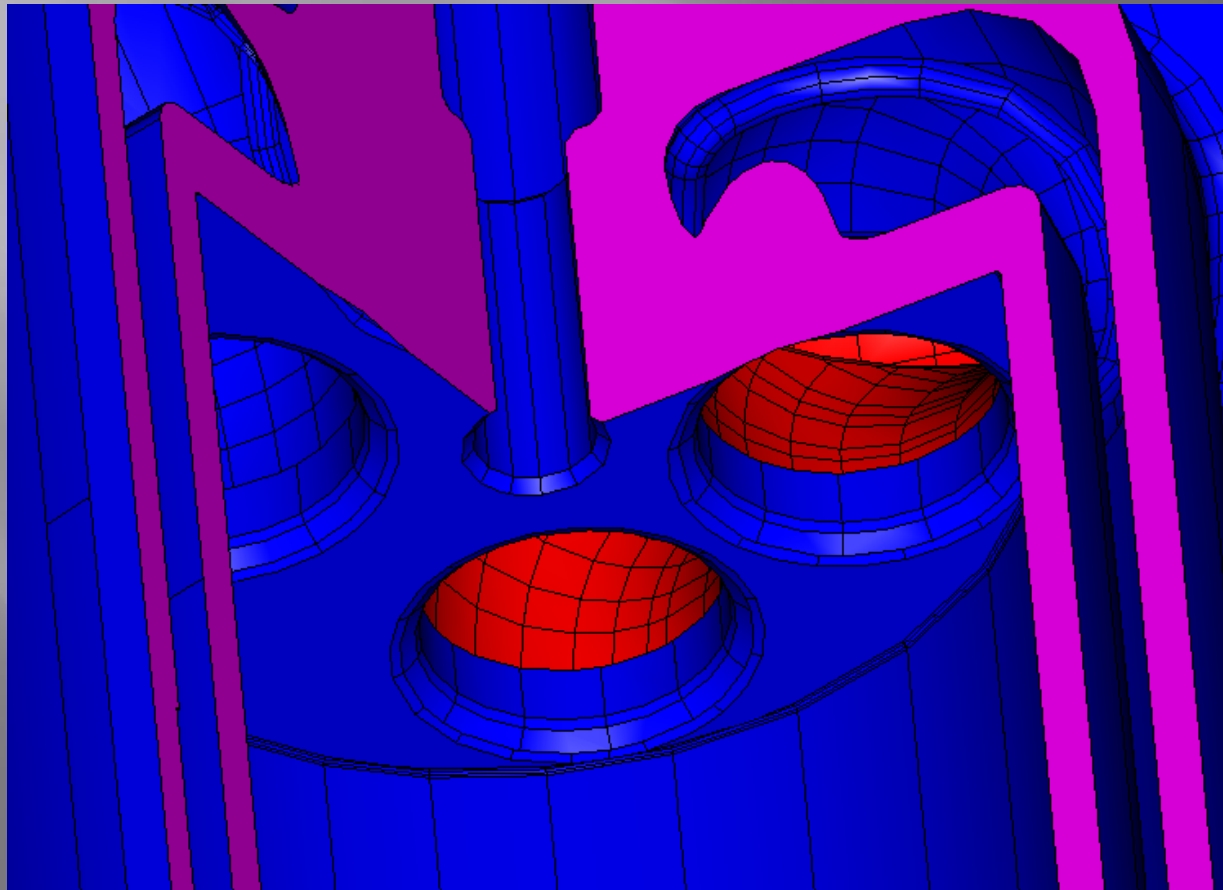
Earnest Henry...Circa 1904



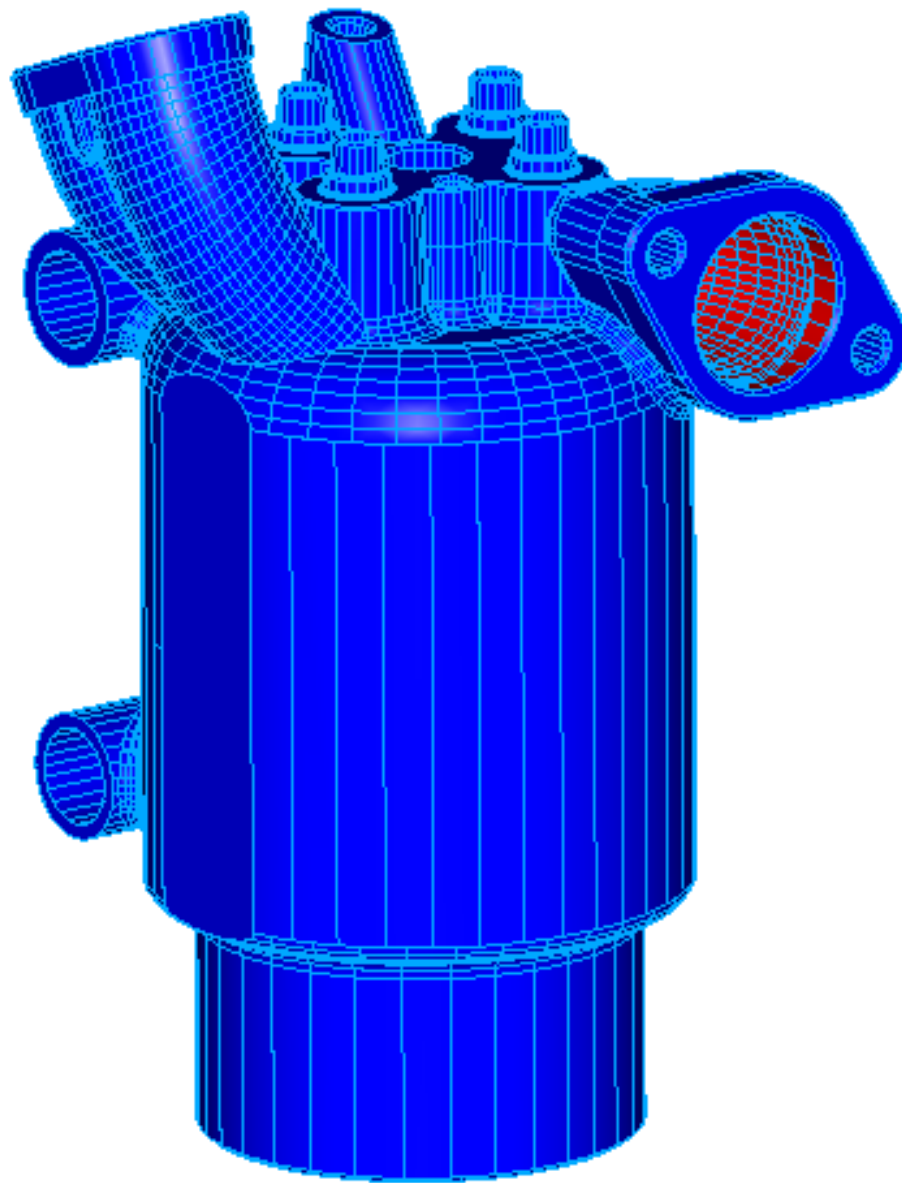
Integrated
Cylinder
Head and
Cylinder
Liner...
A
“Headliner”



“Headliner” Detail w/Integrated Valve Seats

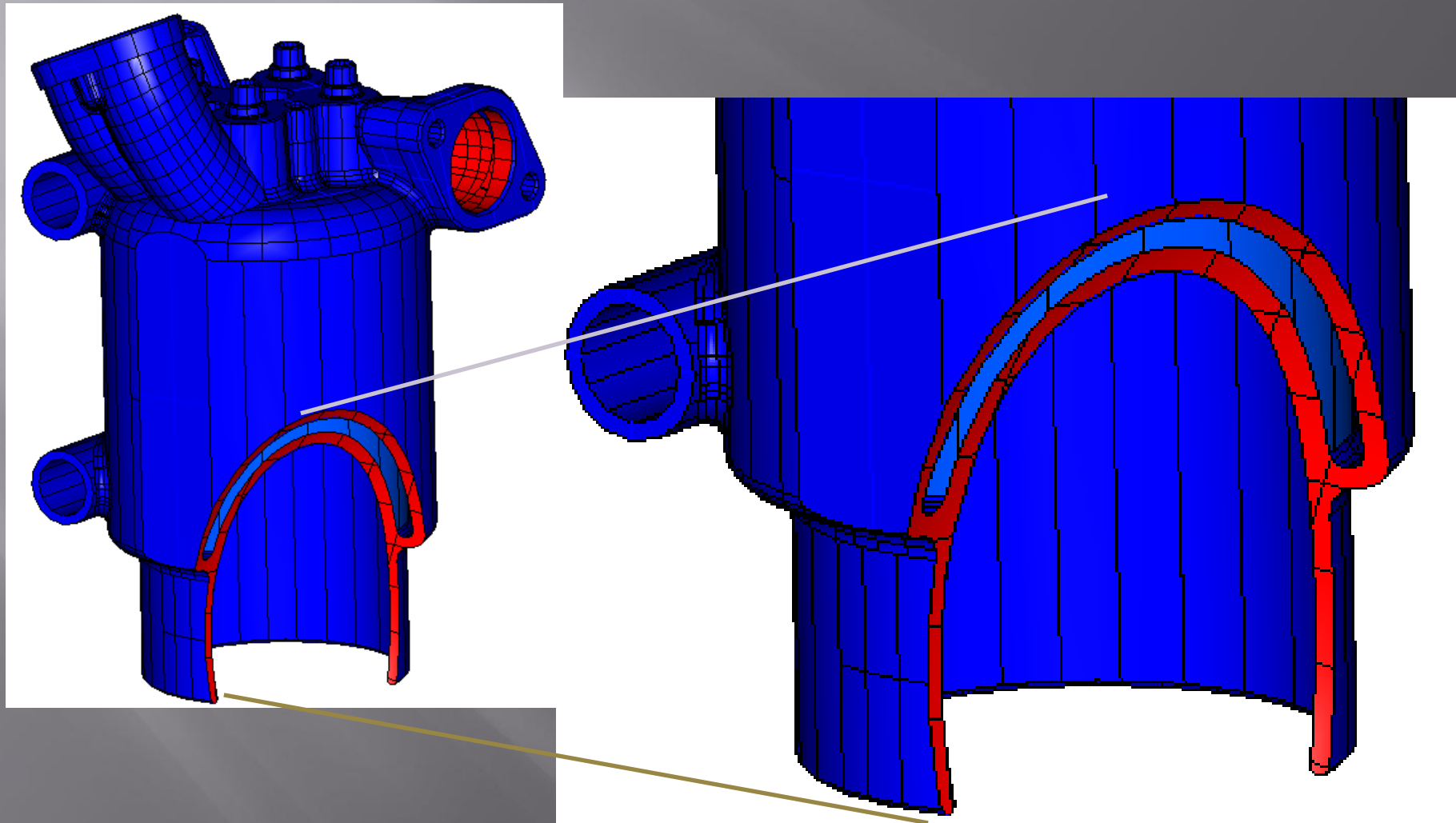


Isolating the coolant entirely within the cast iron headliner is the enabling feature for widespread cost effective magnesium engines



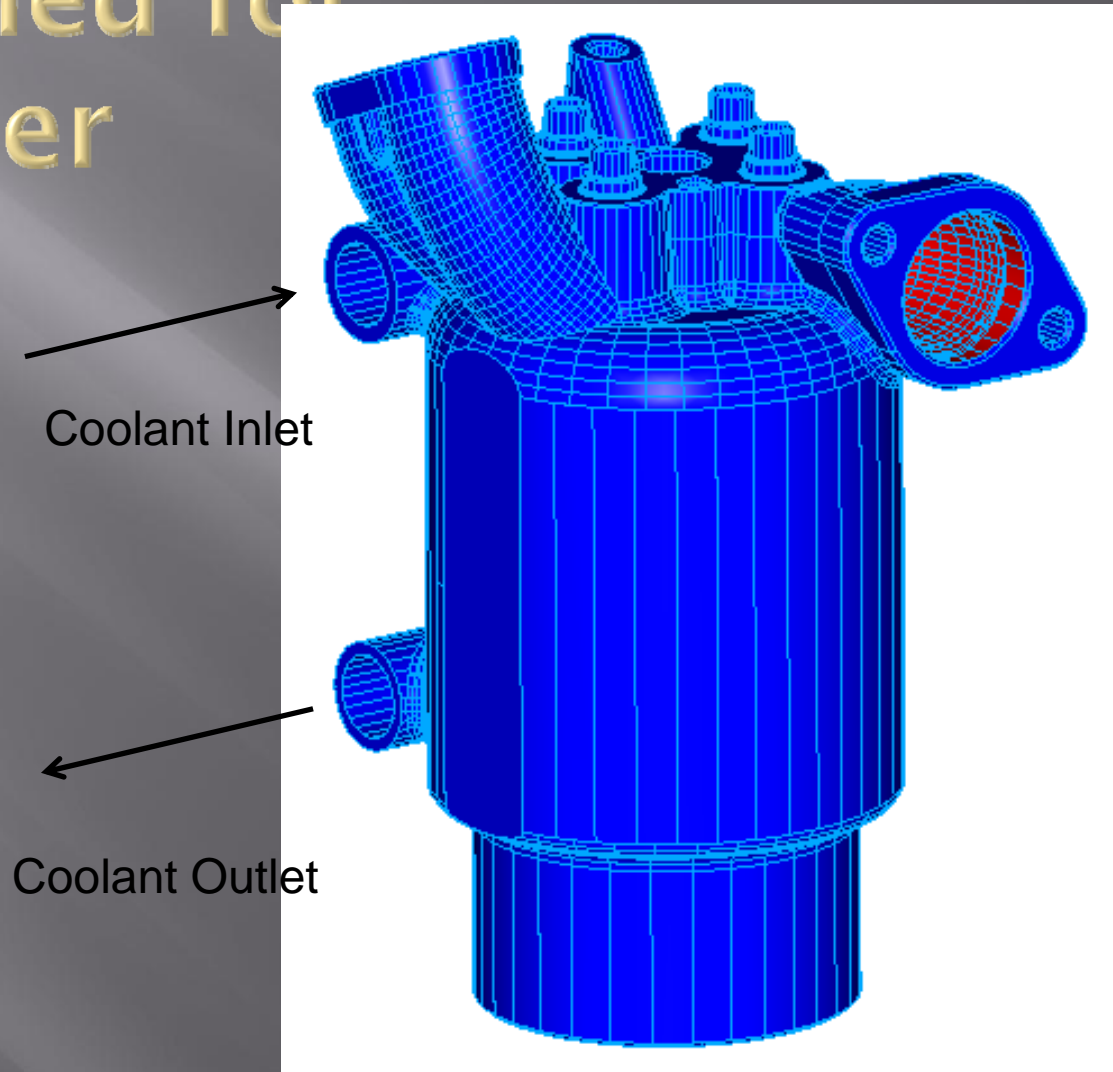
A
Headliner
Cast in
CGI 450
Combines
Many Parts
Together

Headliner Integral Cooling Jacket

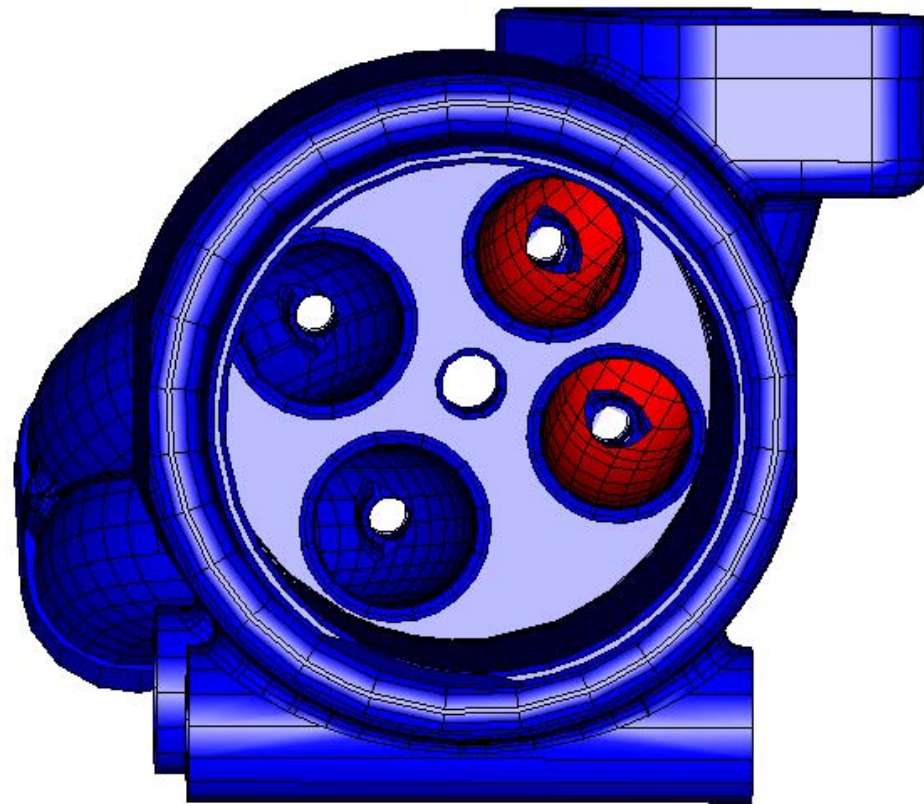


Headliner Coolant Path is self contained for each cylinder

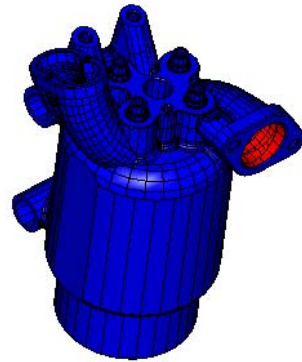
...and the coolant path is daisy chained from cylinder to cylinder per bank



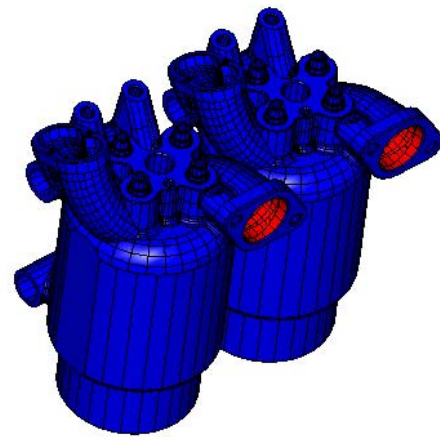
Headliner Bottom View Shows Integral Valve Seats



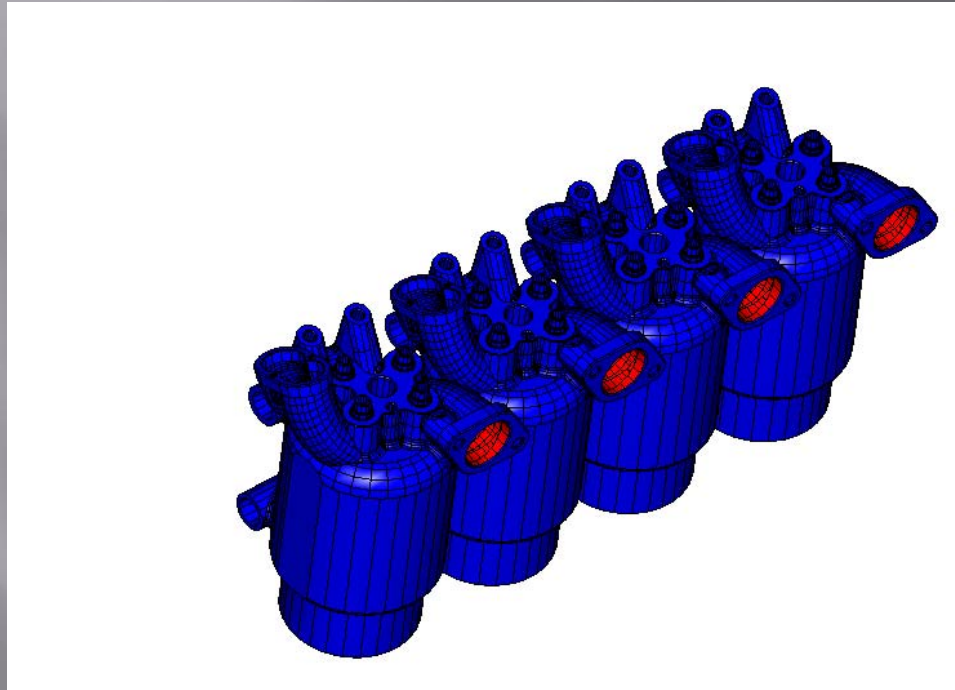
Single Cast-In Headliner



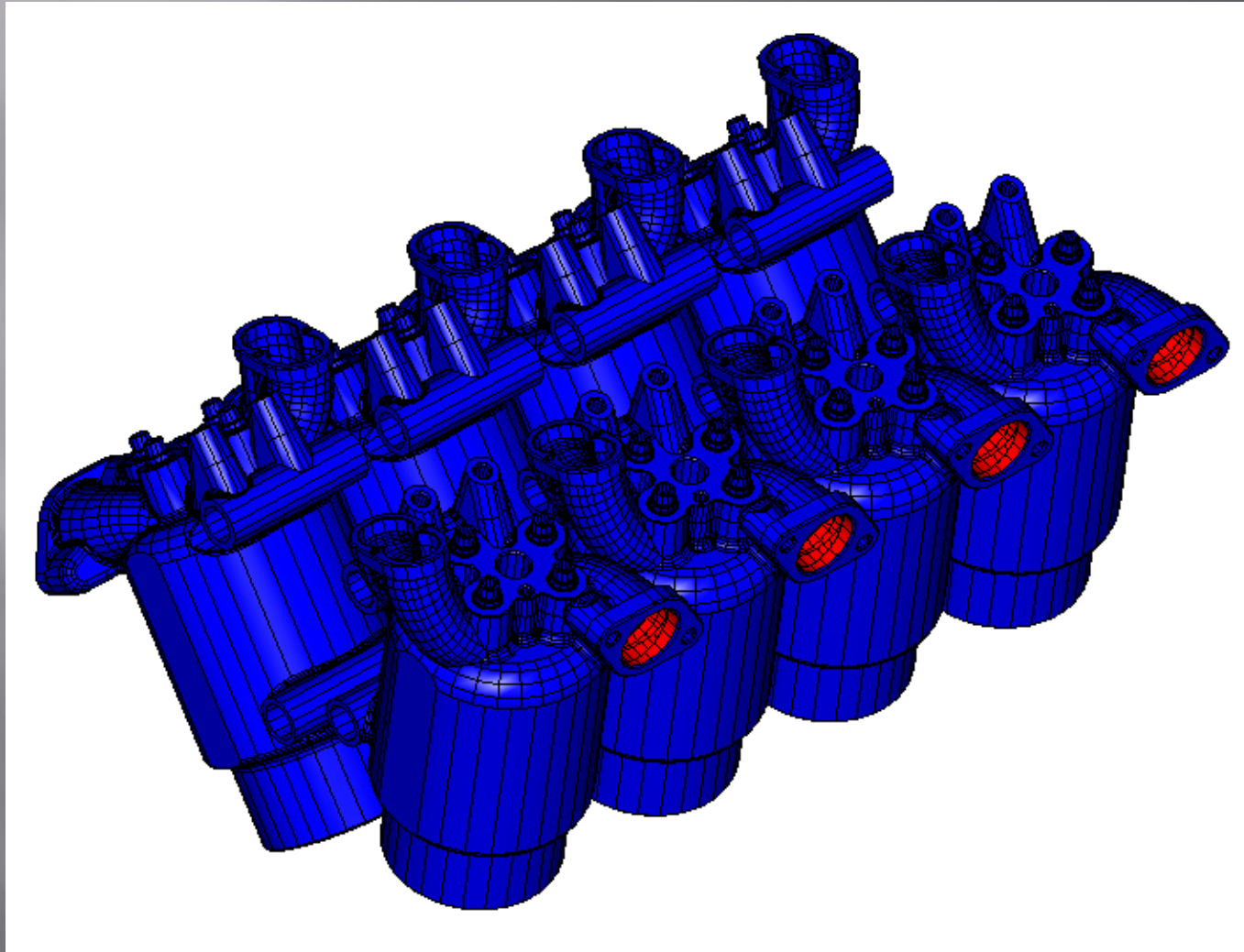
Cast-In Headliner Pair



Cast-In Headliner – One Bank

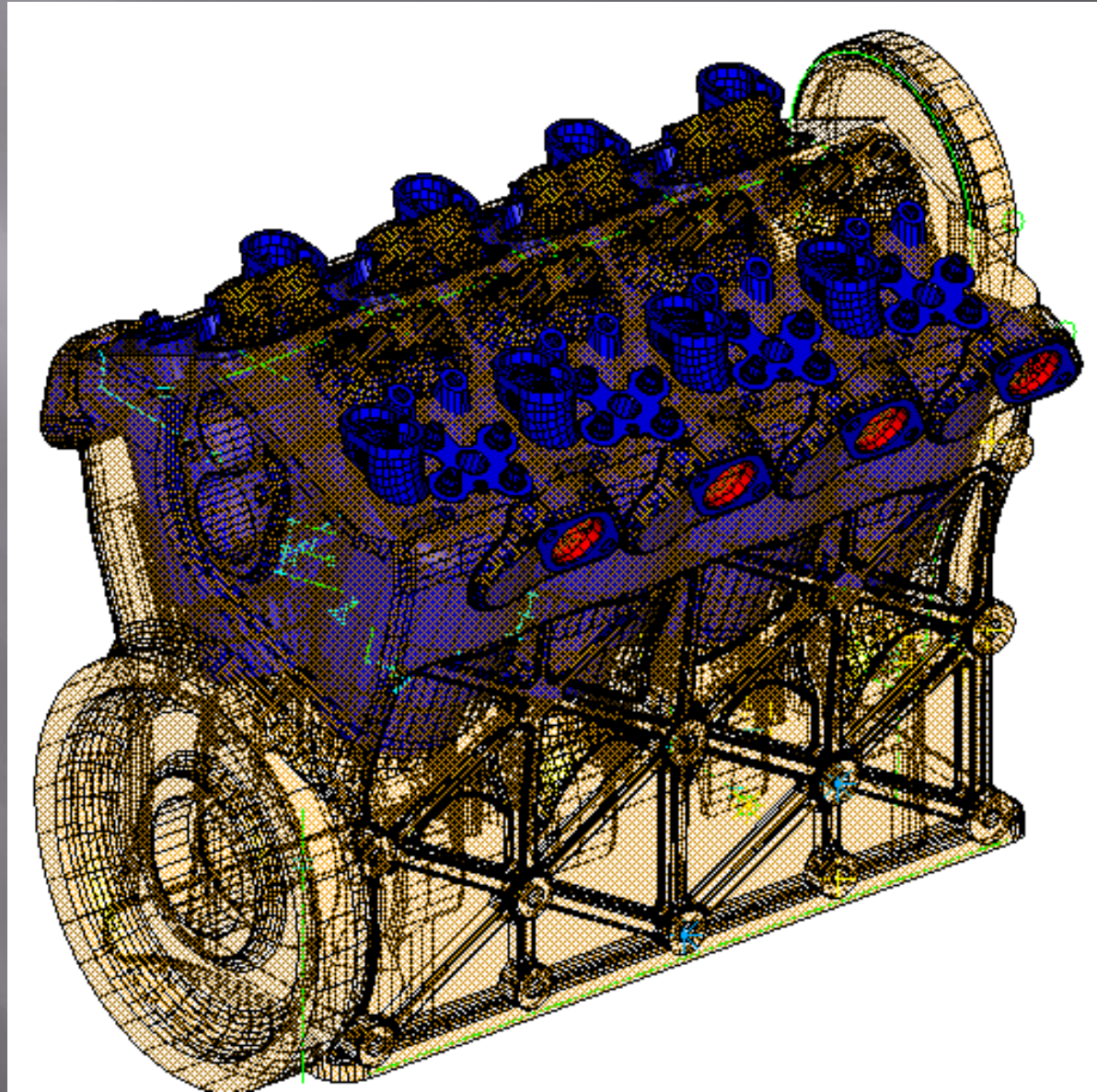


All Eight Cast-In Headliners

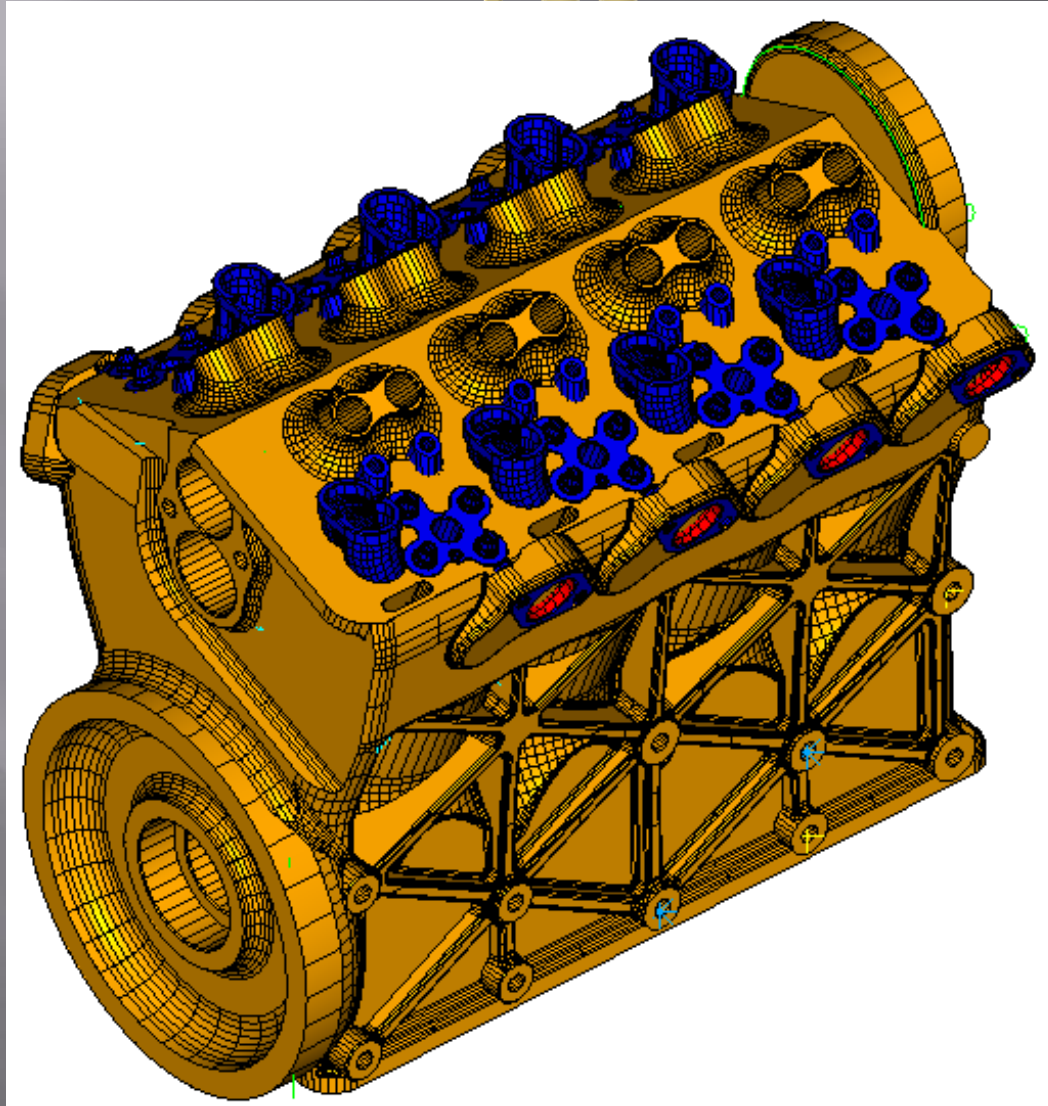


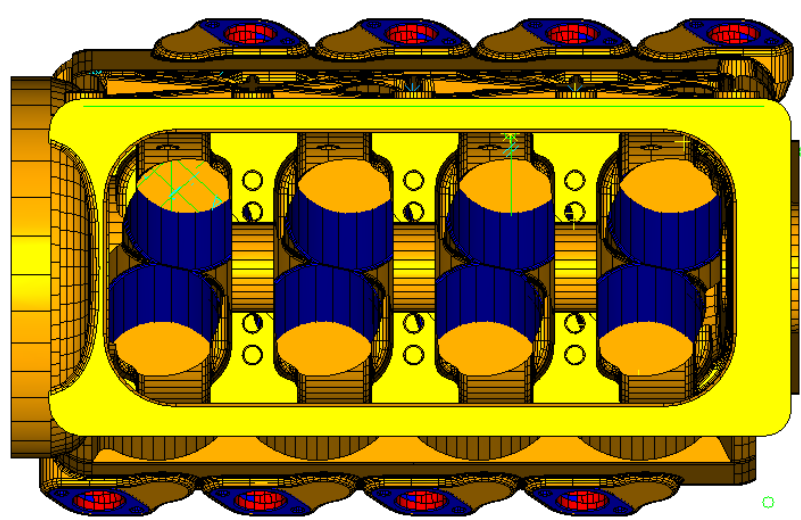
Casting
Has
No Cores

...An
Open &
Shut Die!



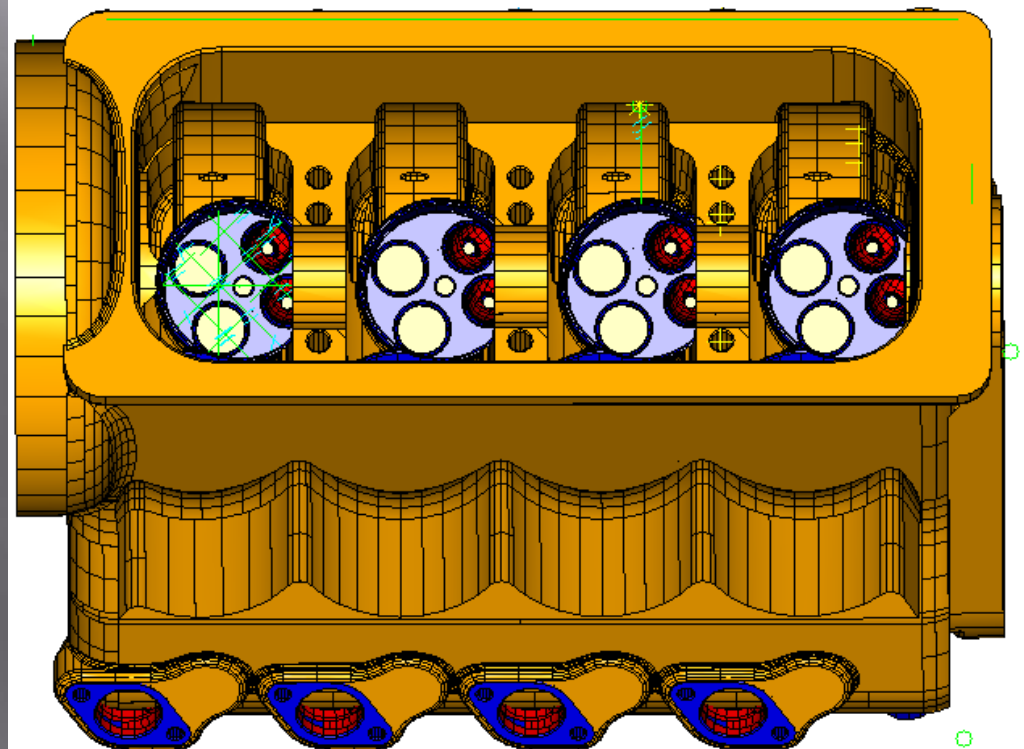
32 Valve One Camshaft High in Vee



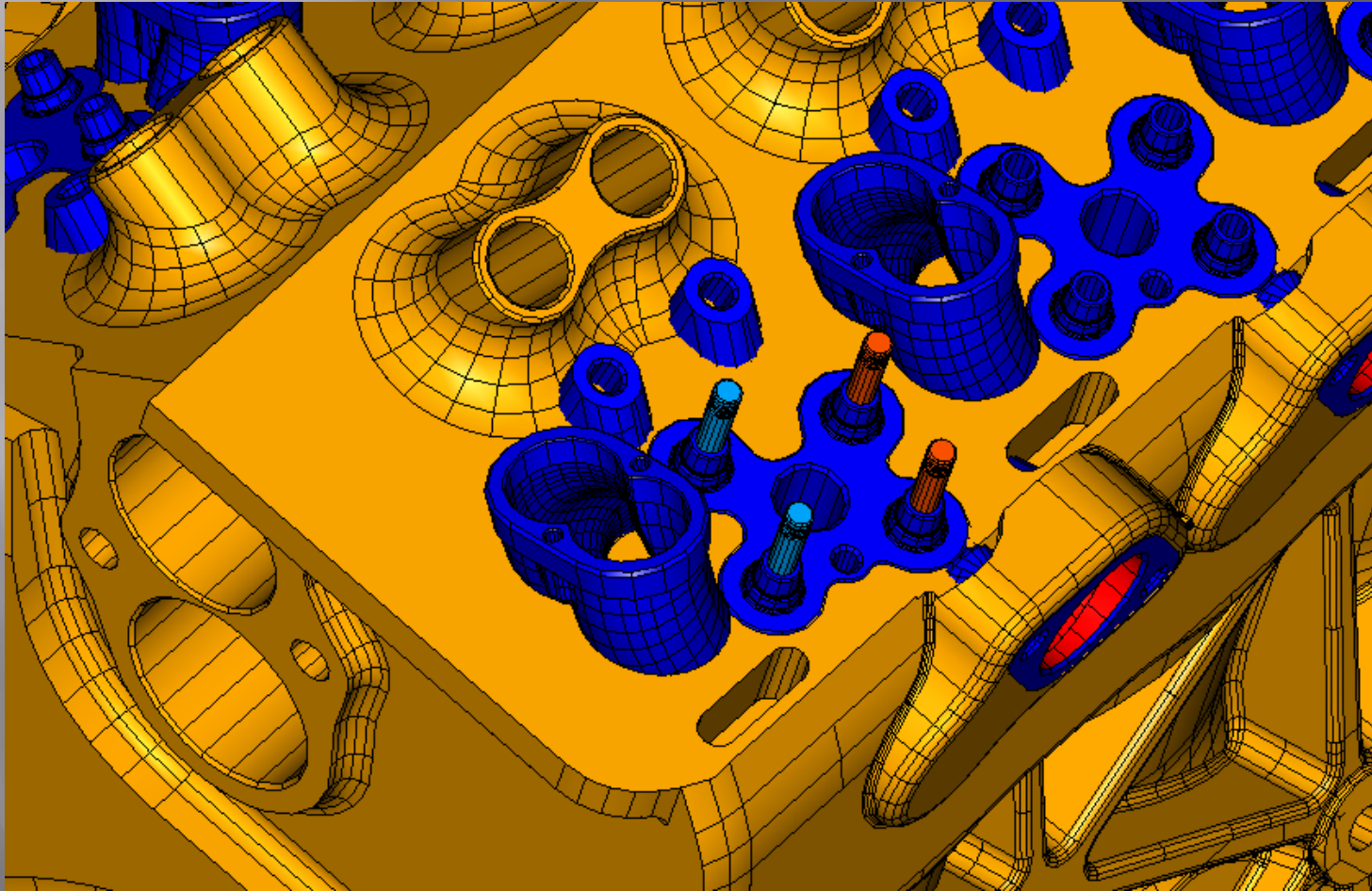


All Assembly &
Machining is
"Bottom Up"

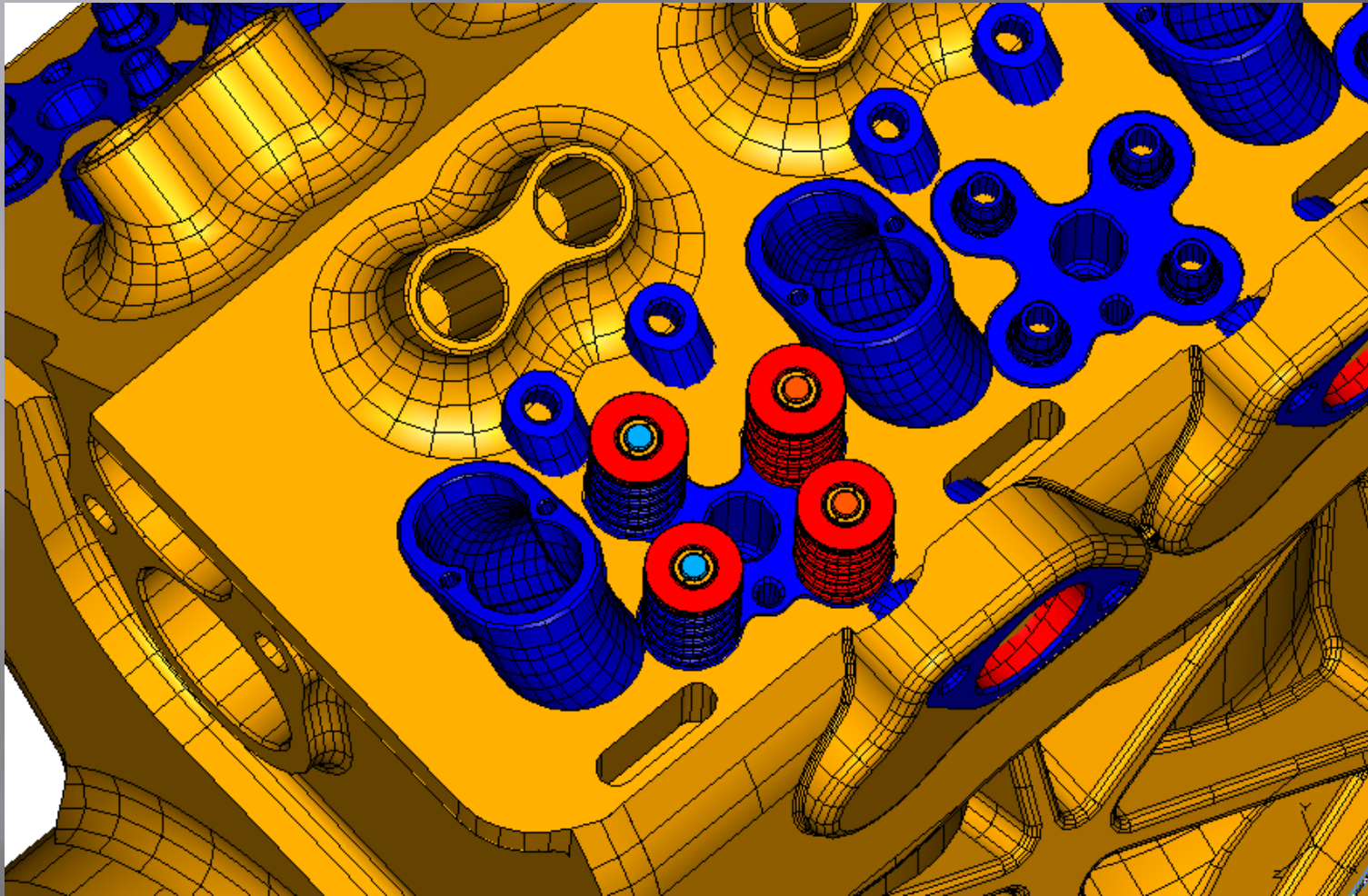
Tilt for
Access to
Valve Seats
&
Boring/Honi
ng



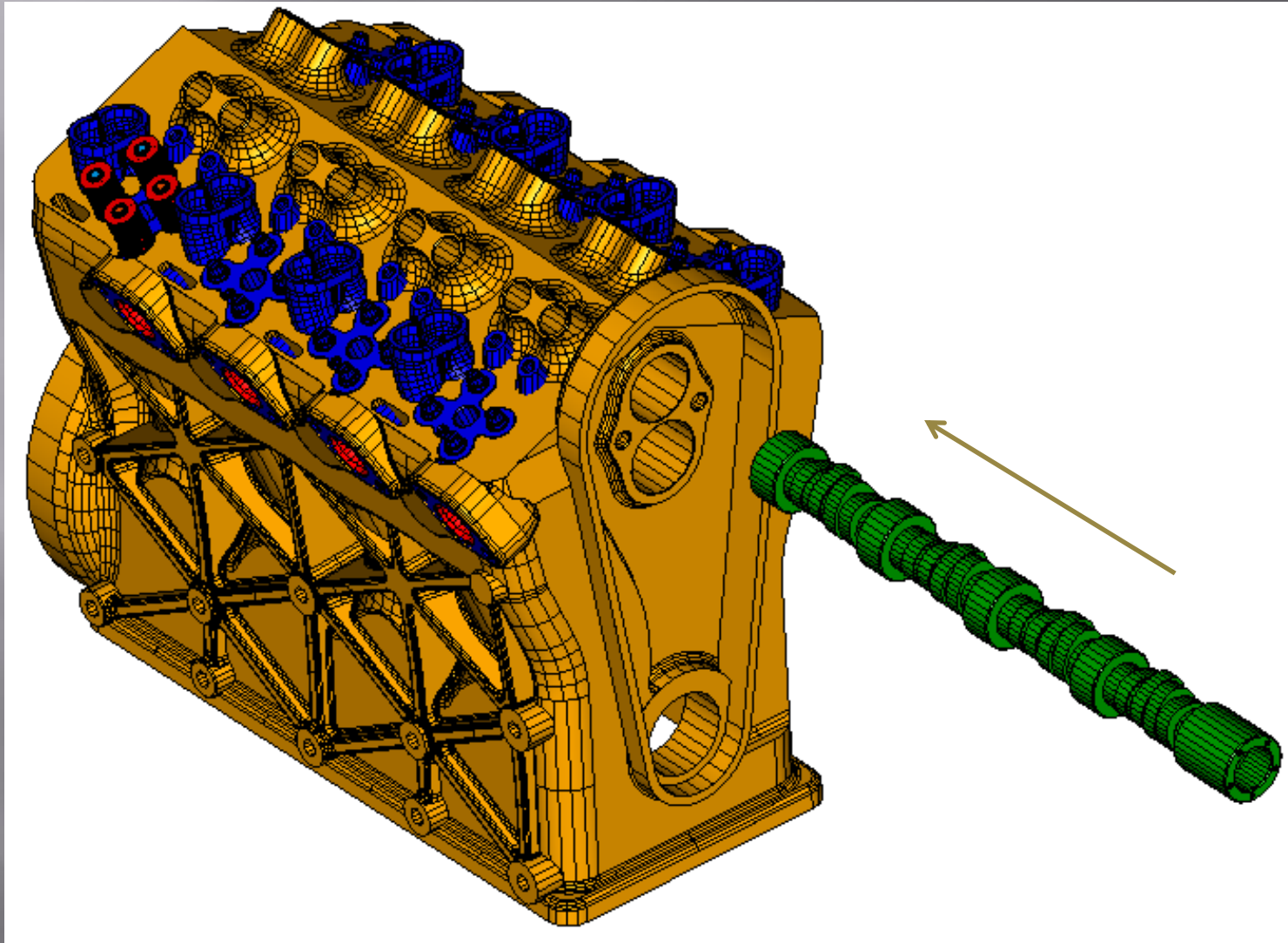
Valves are Installed From Bottom



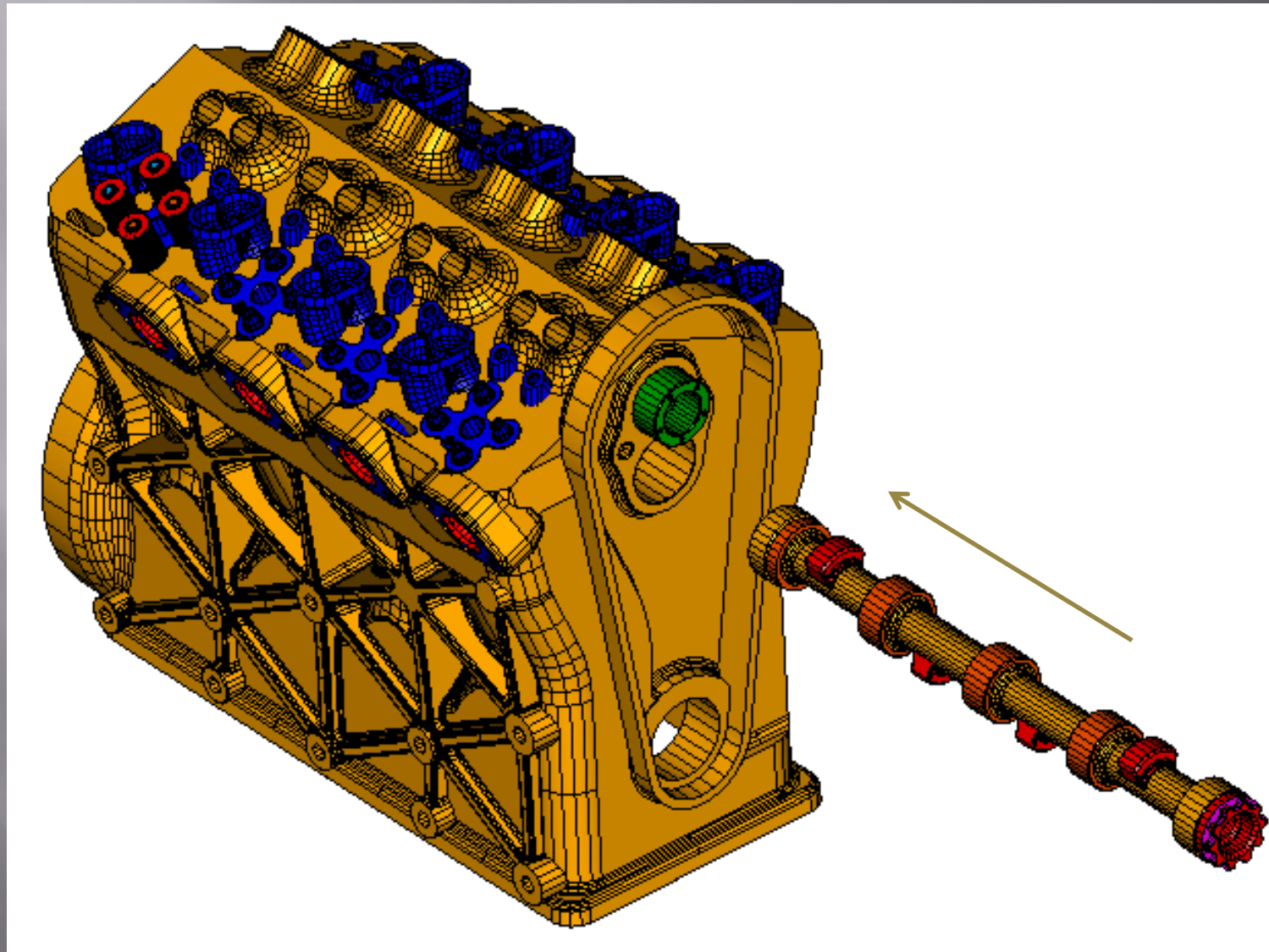
Install Valve Springs & Retainers



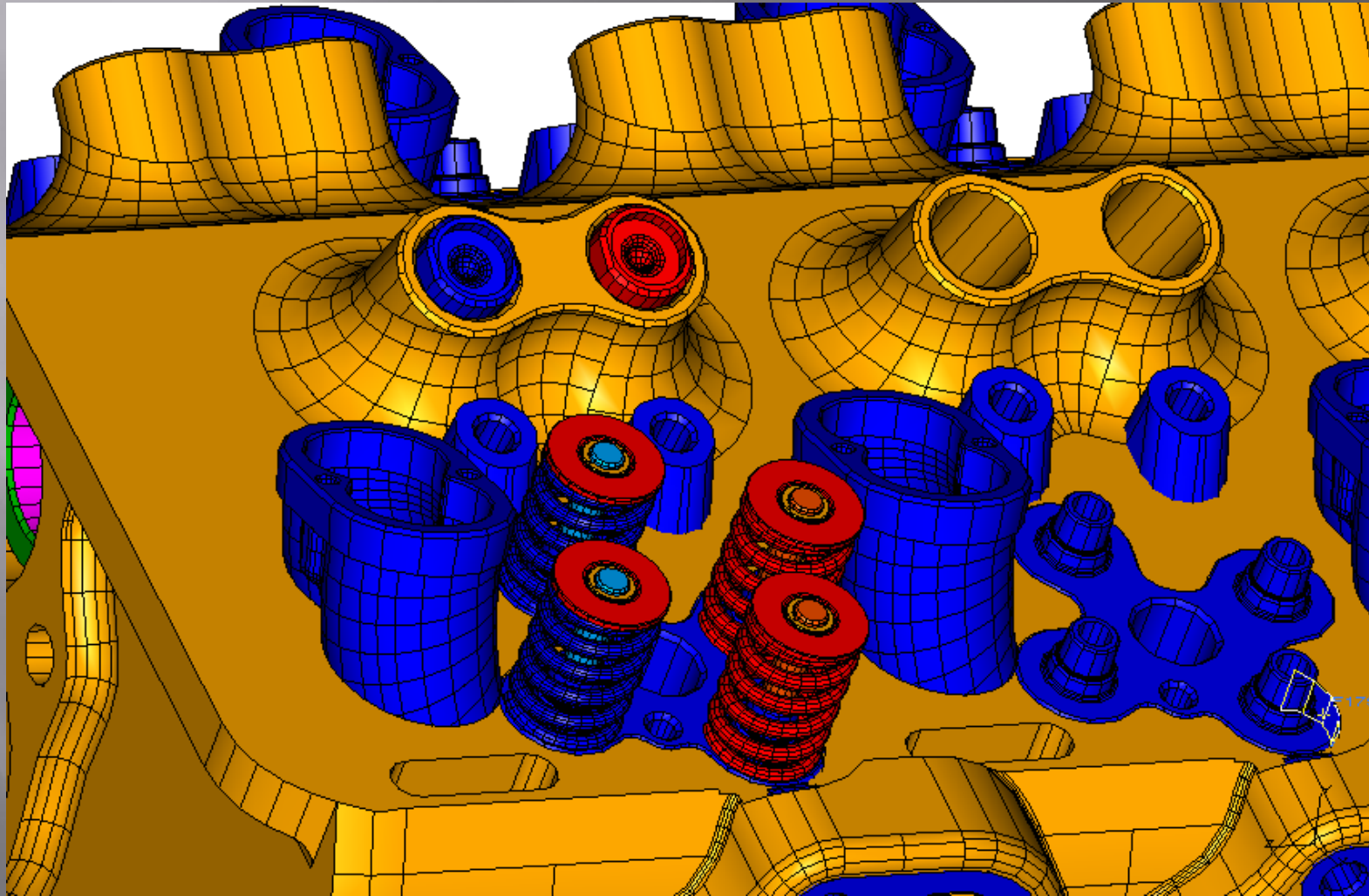
Install Camshaft



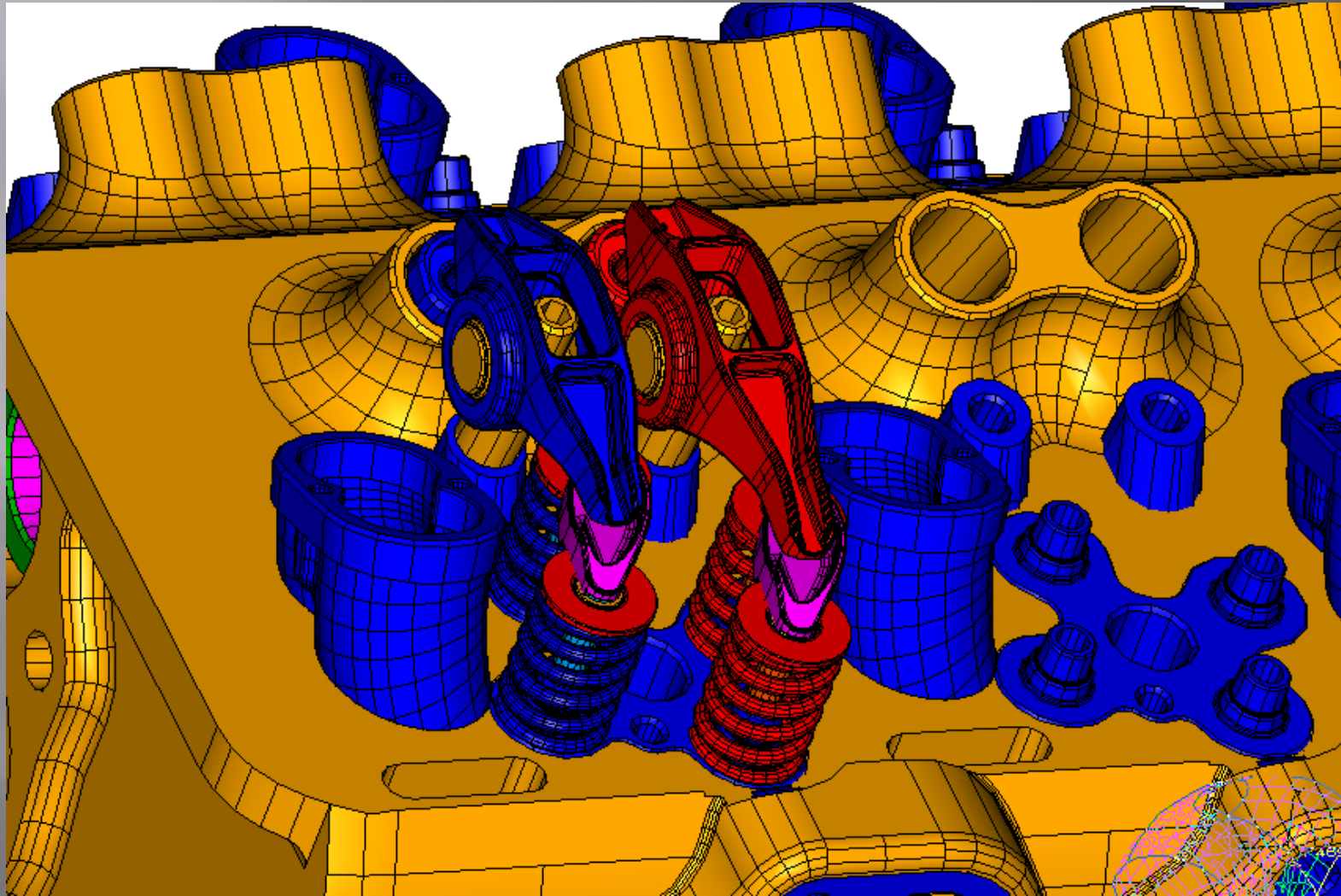
Install Balance Shaft



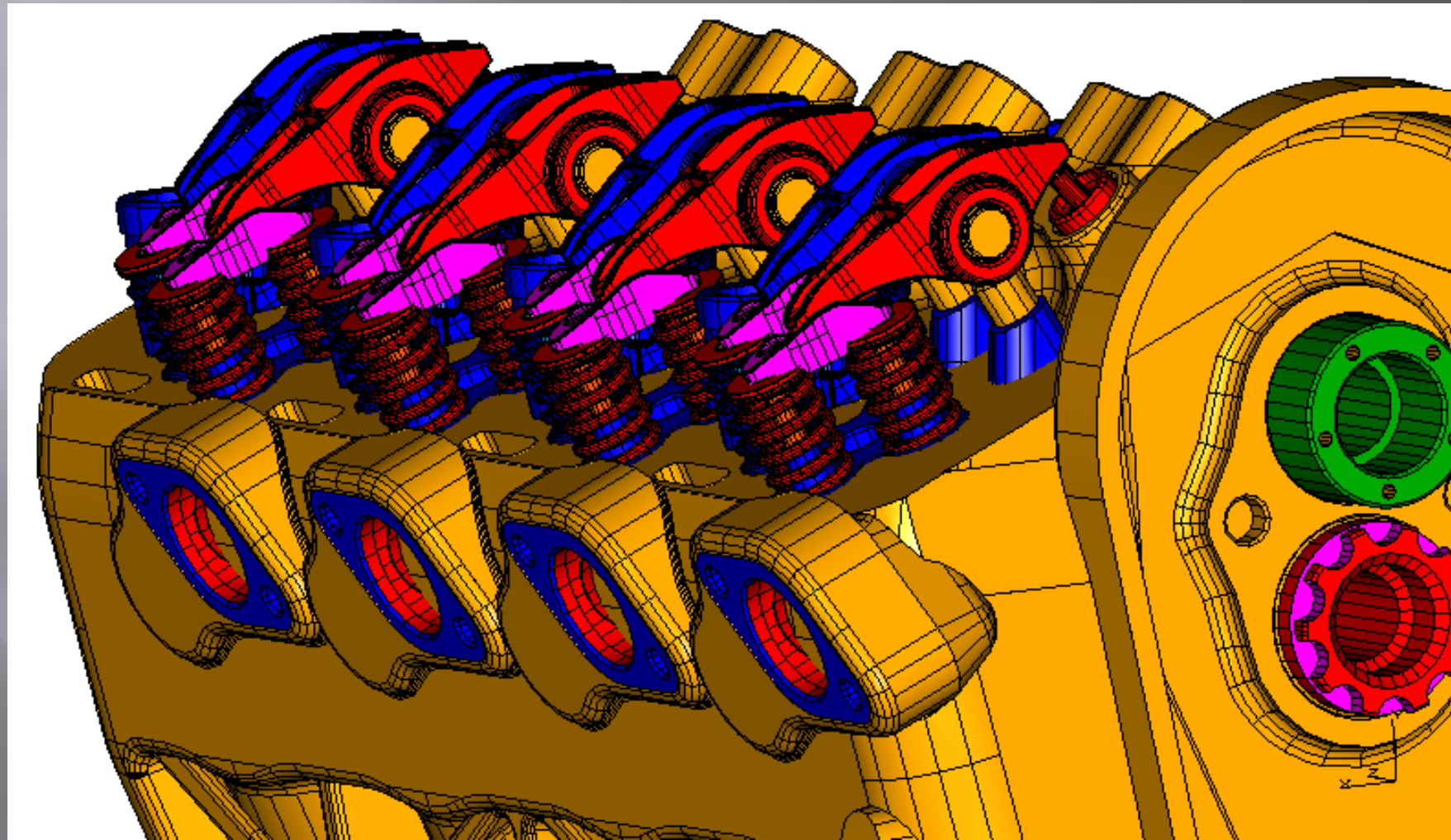
Install Standard Hydraulic Tappets



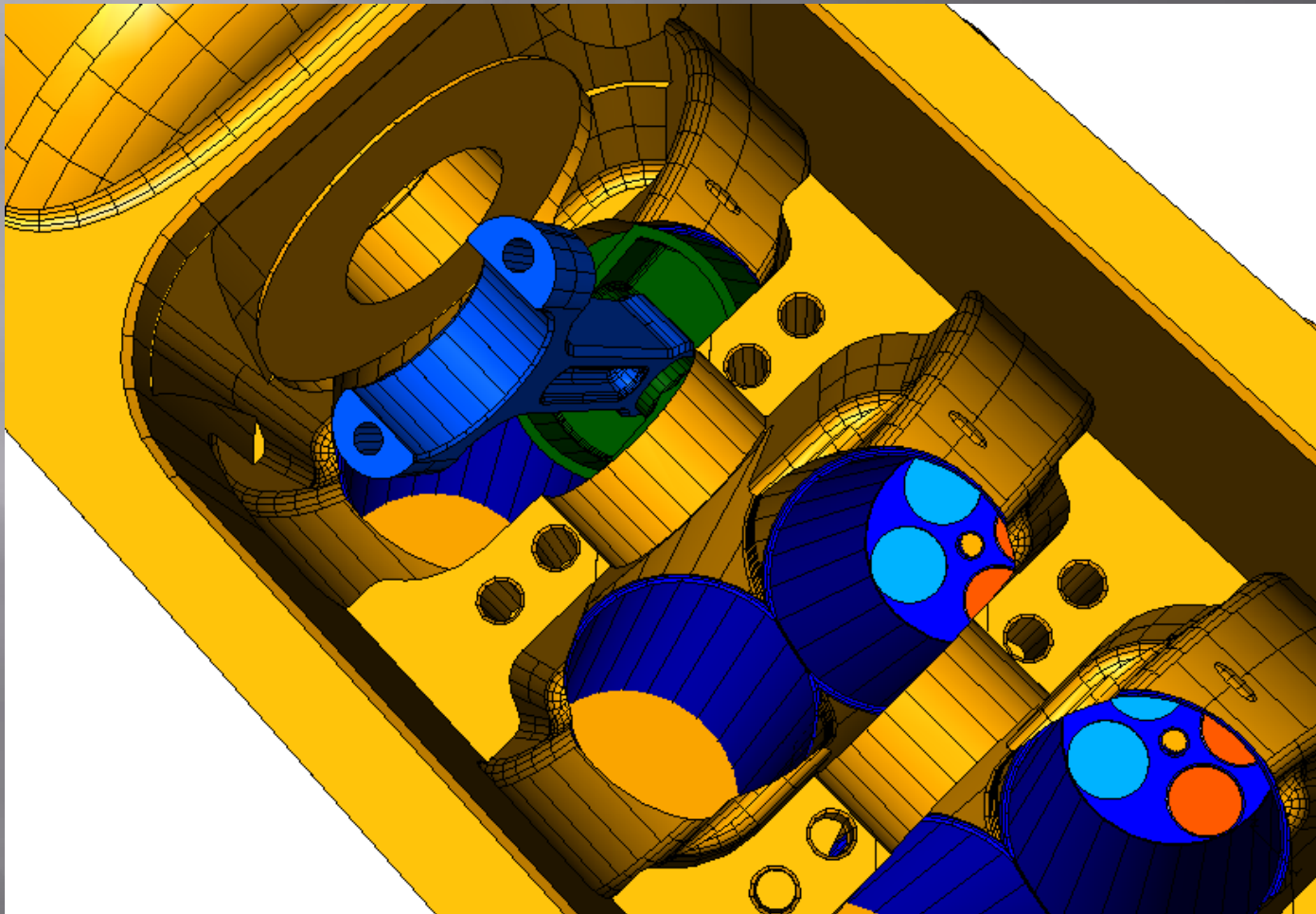
Install Rocker Assembly



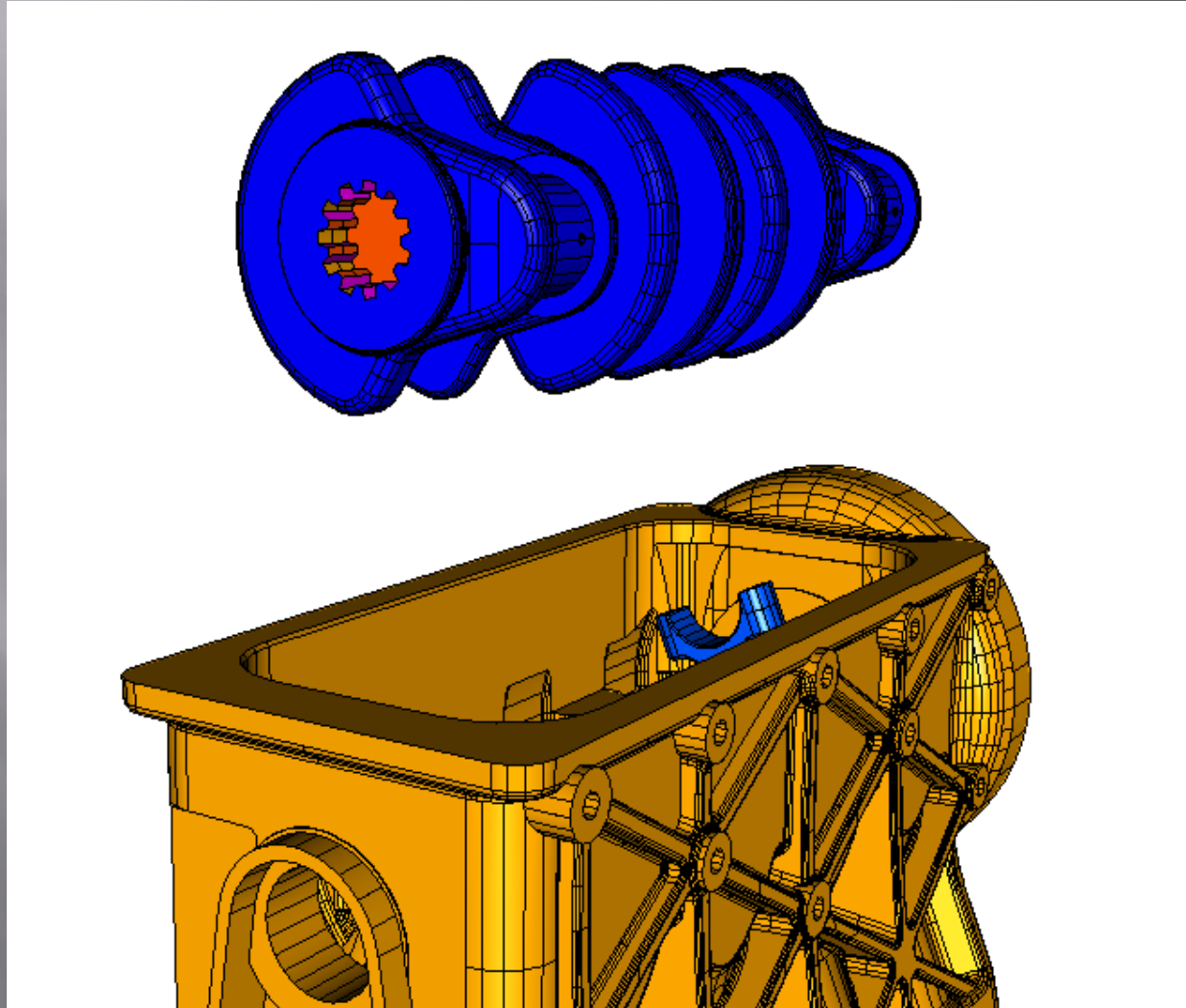
Look Familiar? But No Pushrods



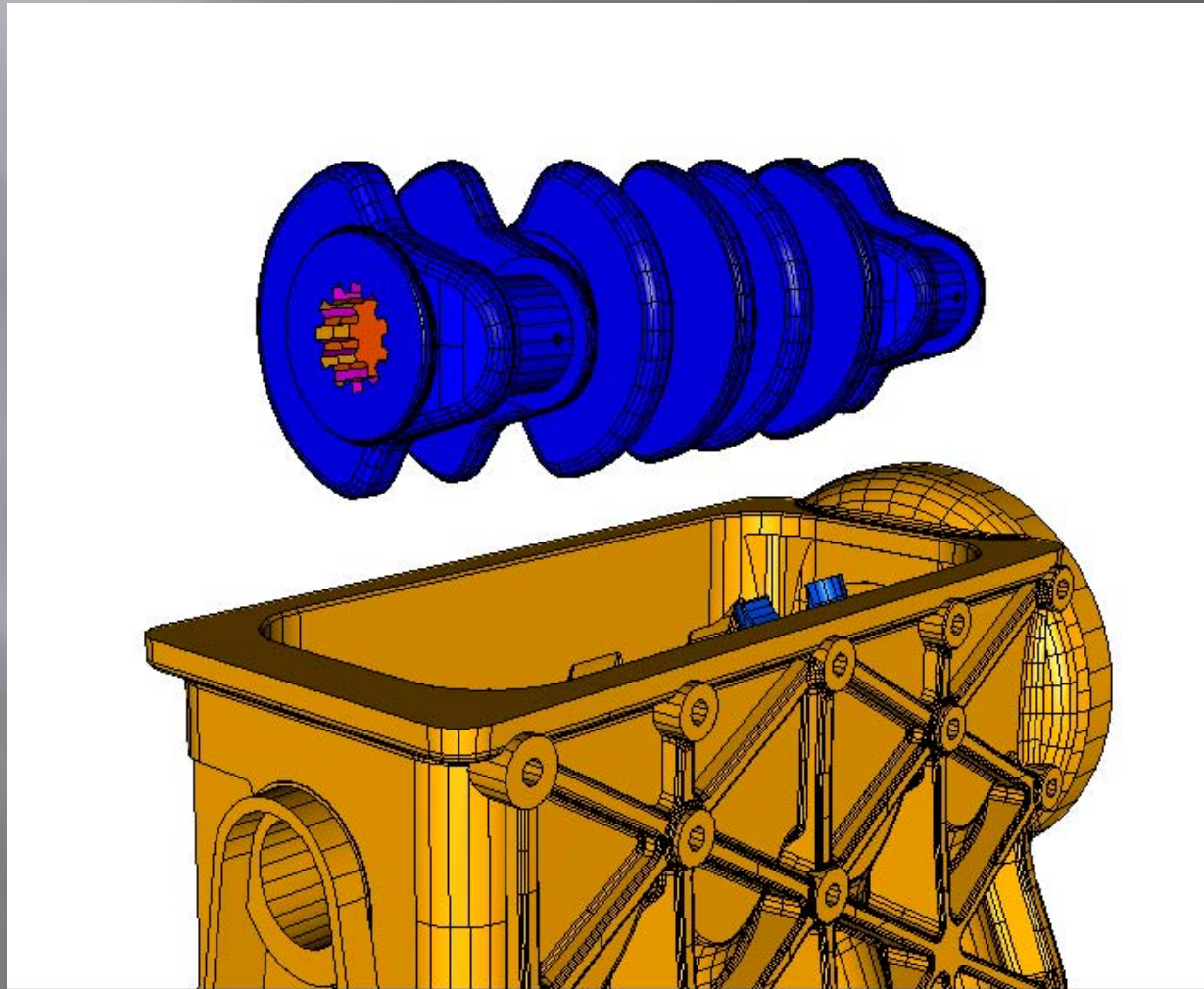
Piston/Conrod Assembly Inserted on a Dogleg Path



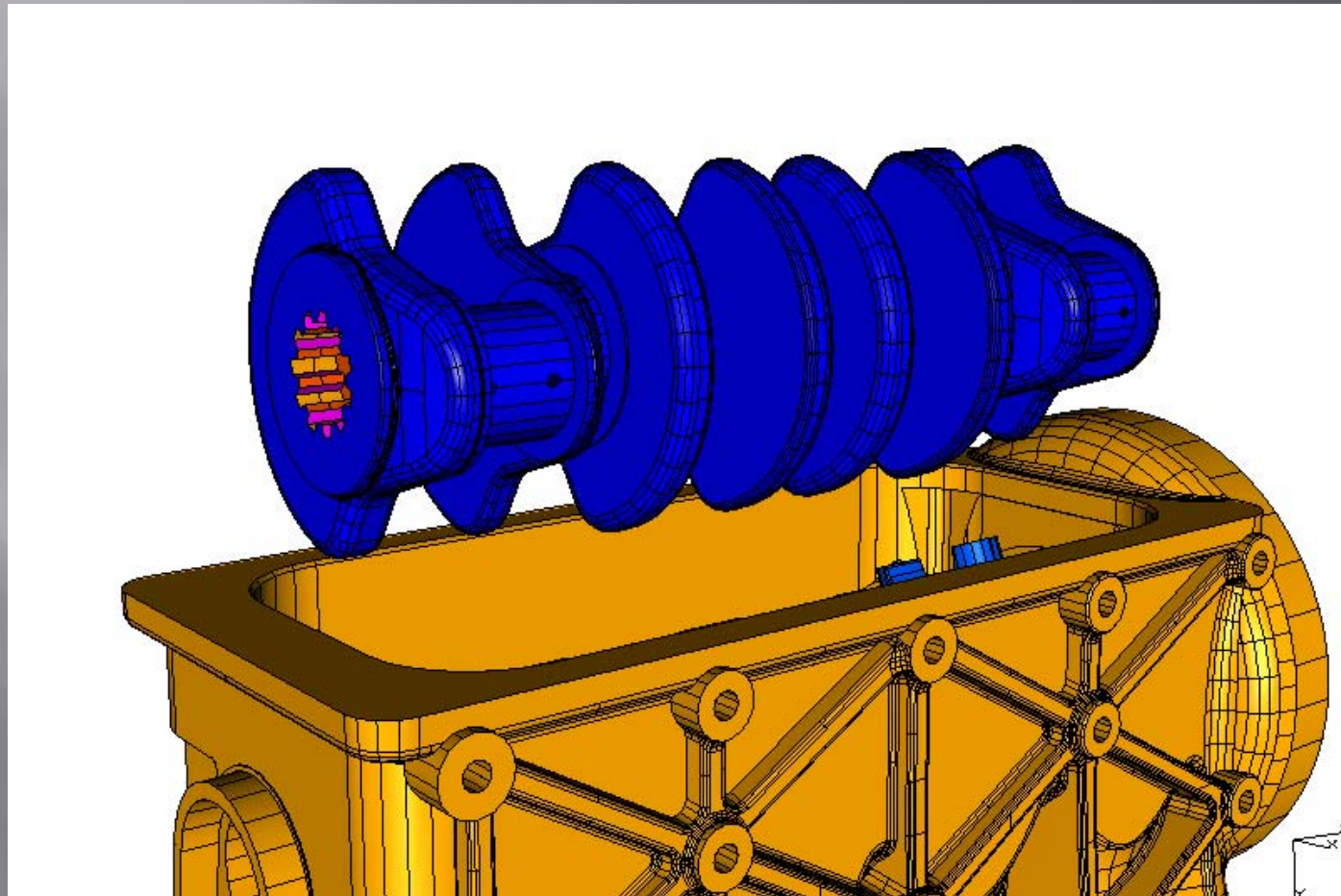
Splined Double Shear Crankshaft



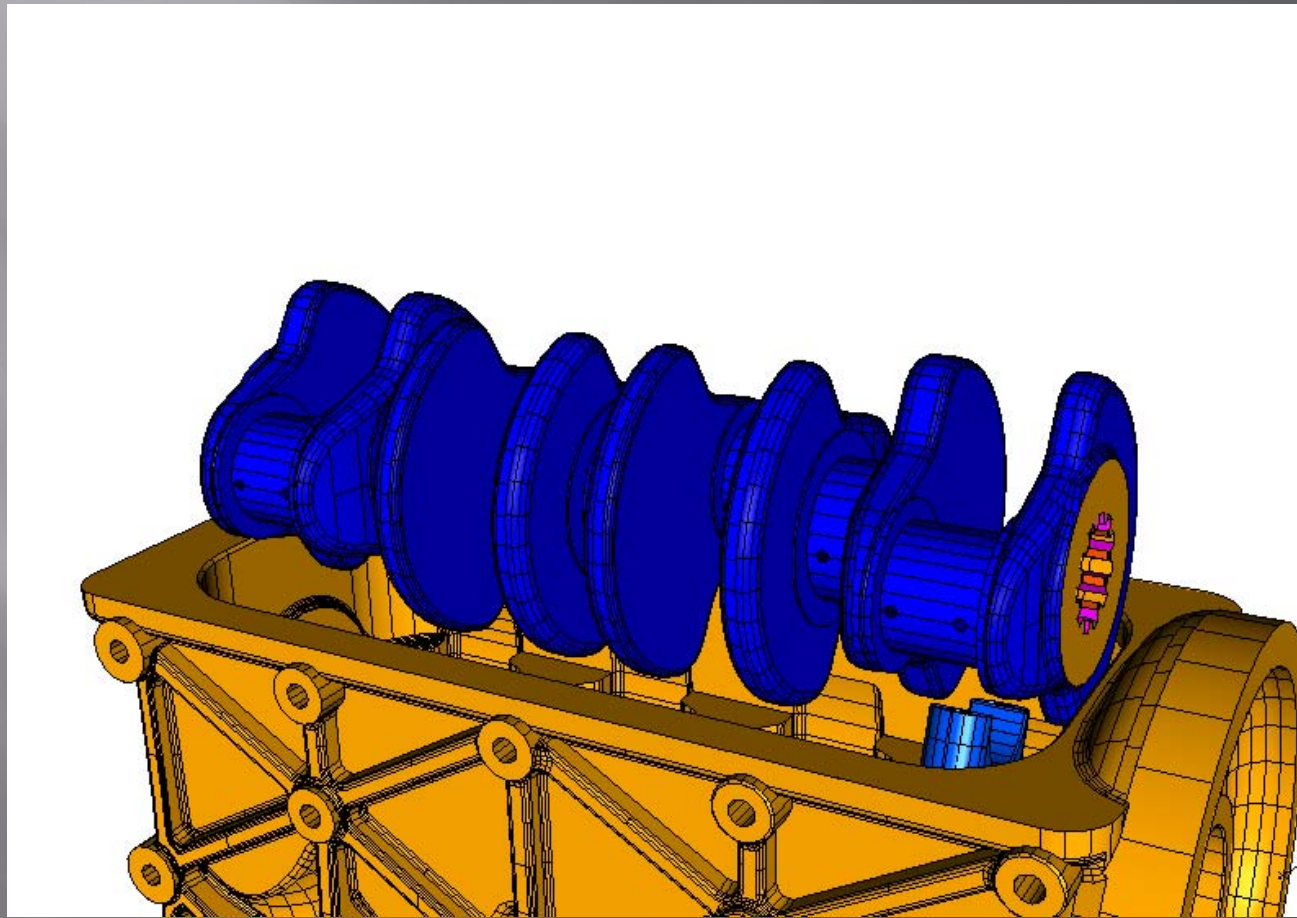
Drops In Vertically, But...



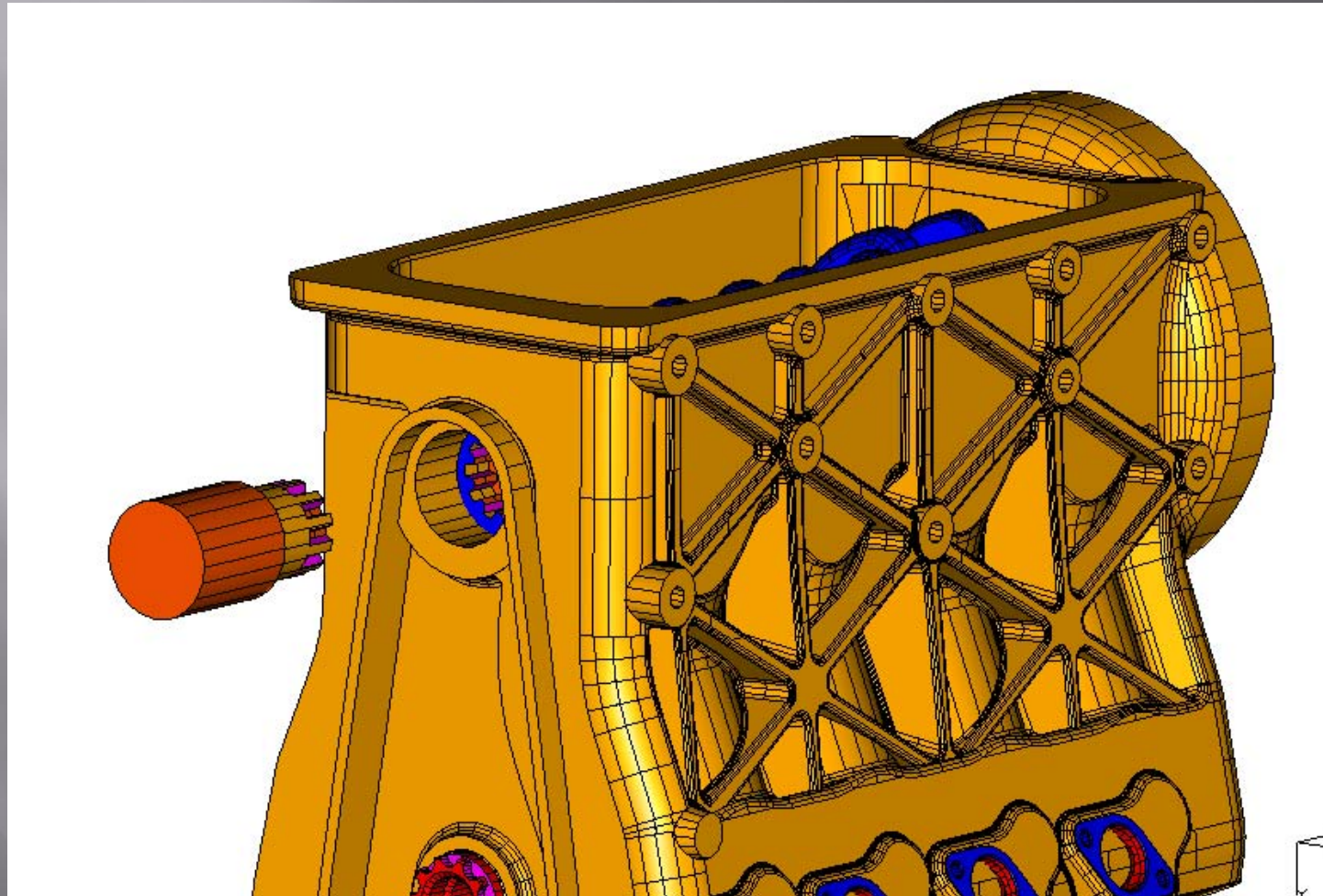
The Front & Rear Bearings are not Clamshells



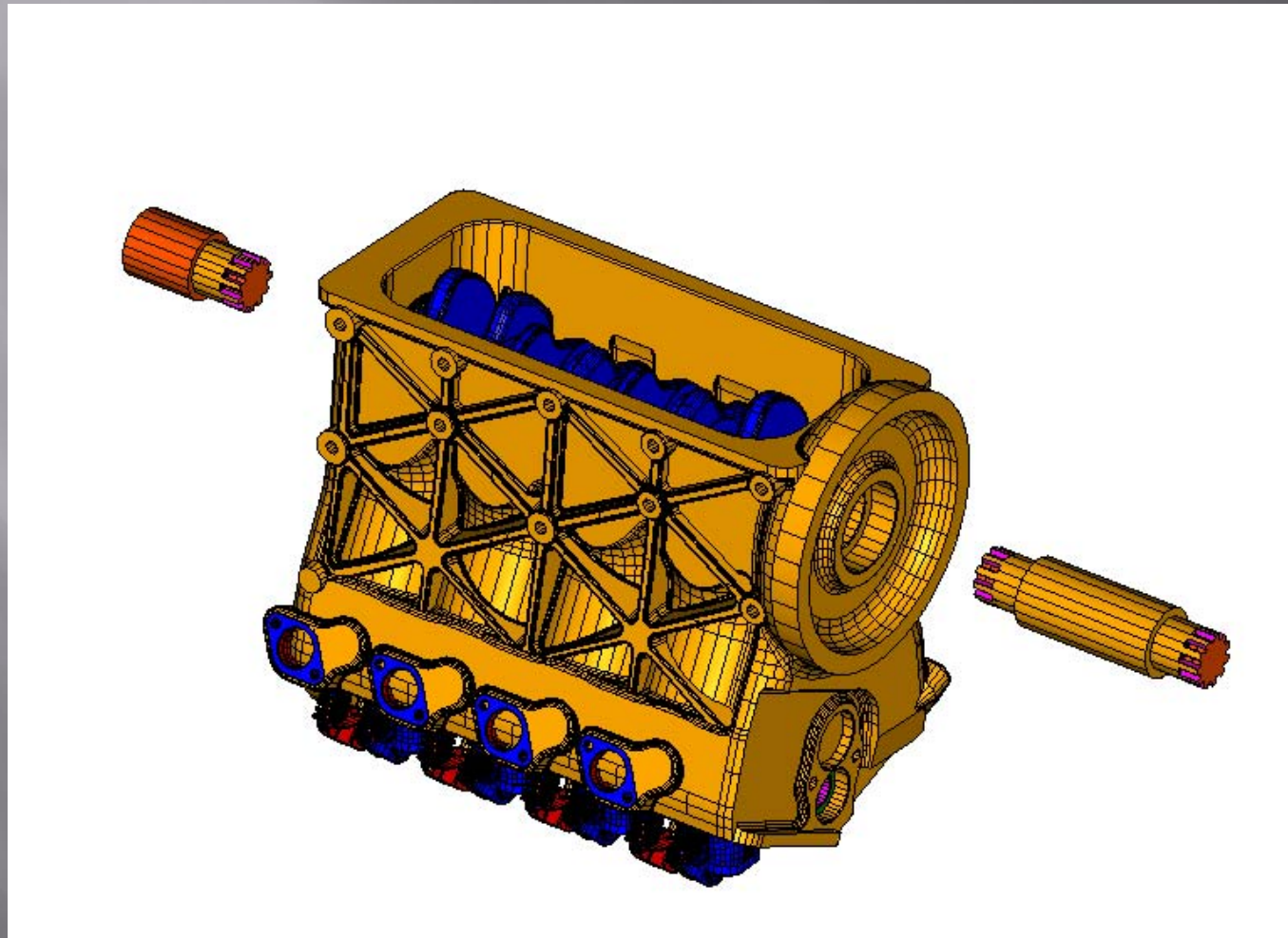
Crank Has Splined Ends To allow
It to be “Book-Ended”



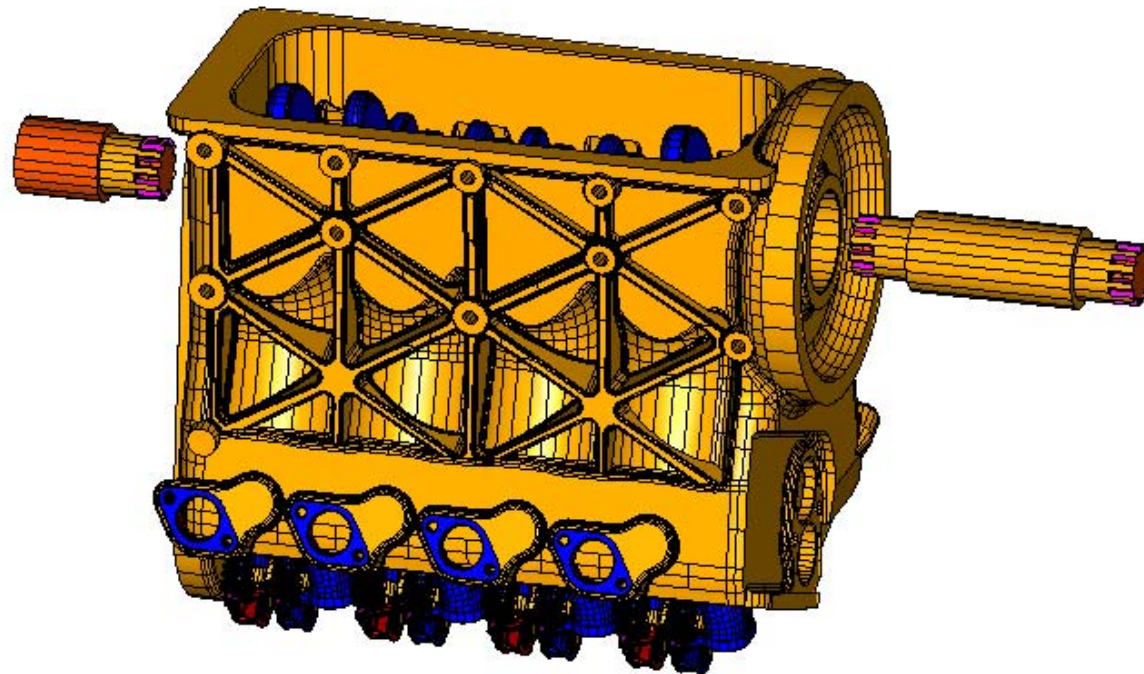
Front Splined Shaft



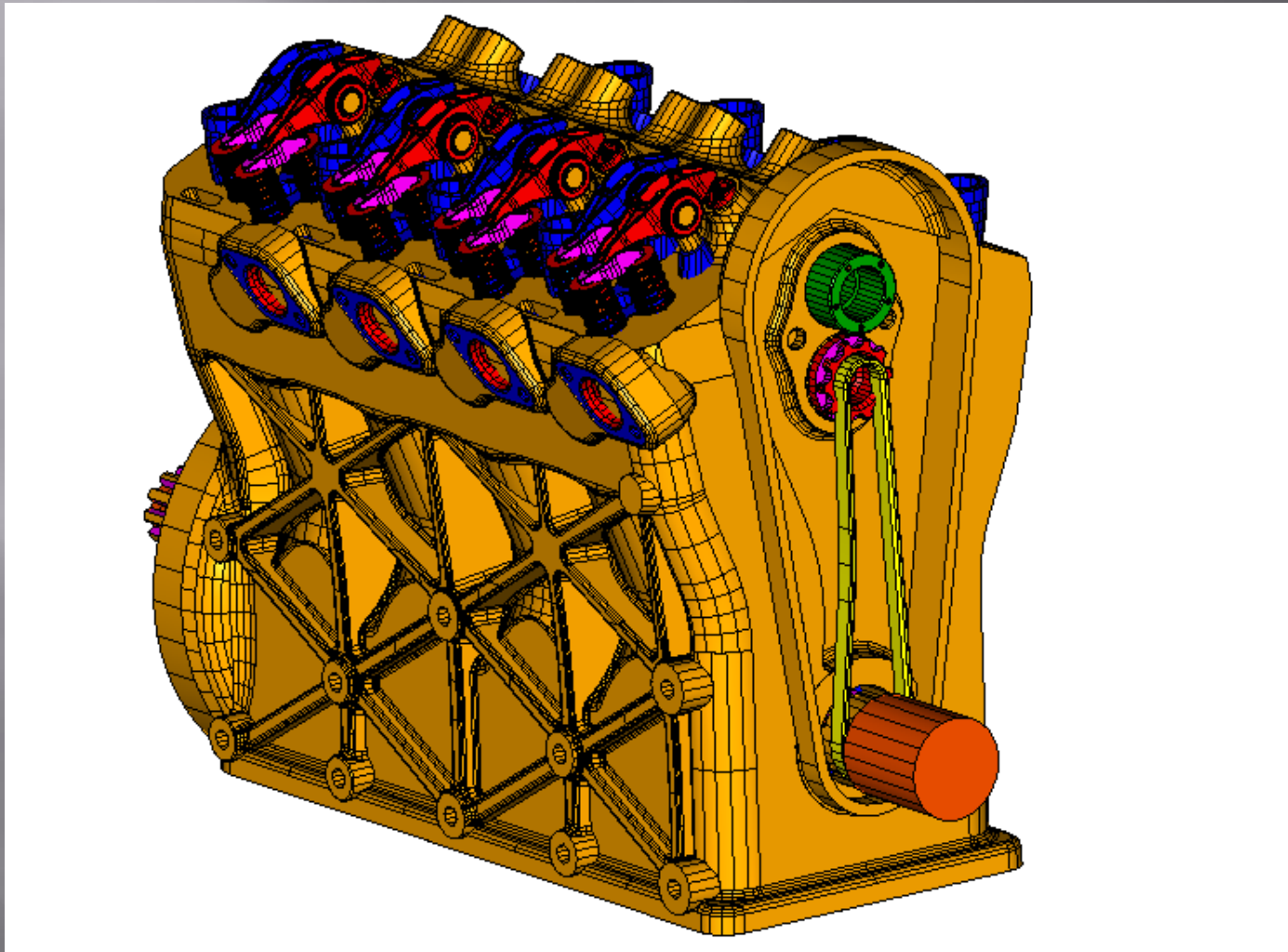
Crank is supported at Ends by two Splined Axially Inserted Shafts



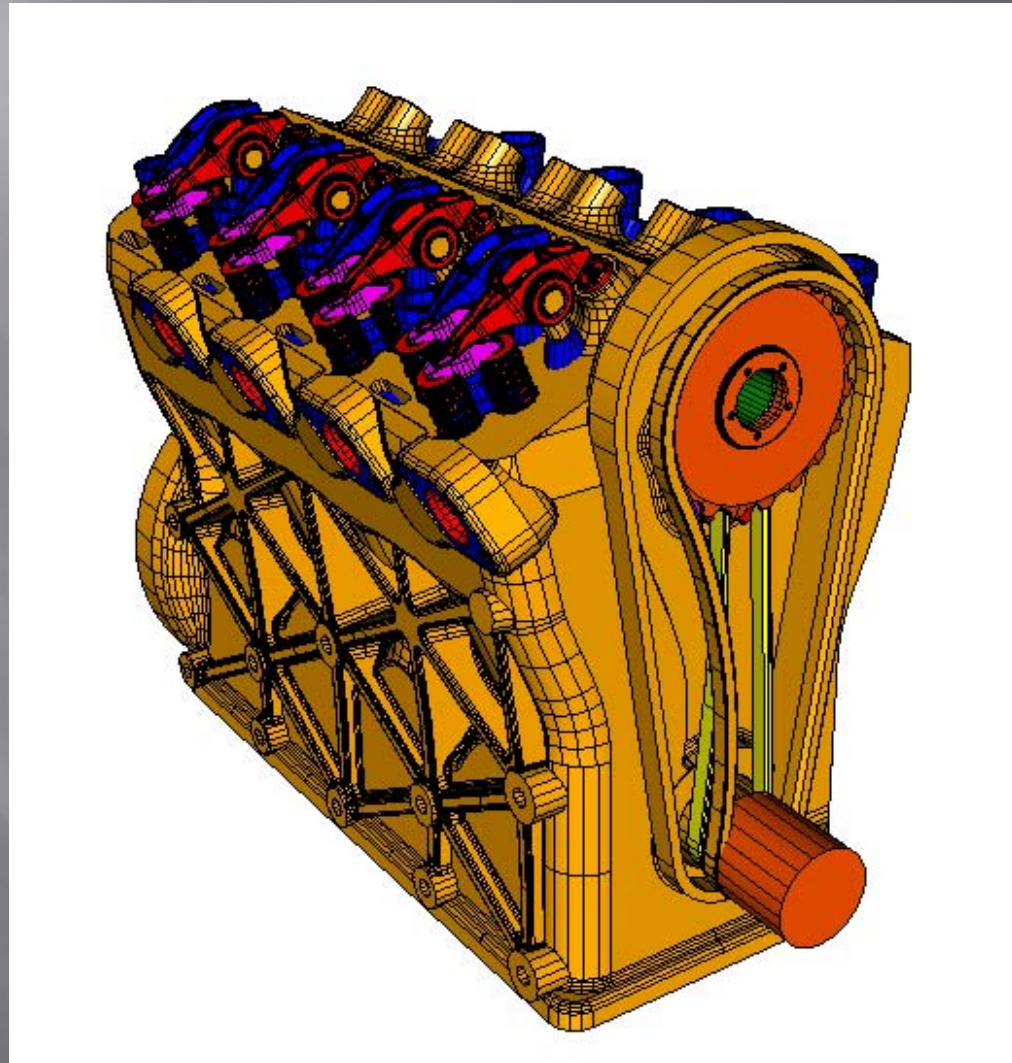
...Resulting in a Highly Rigid Block



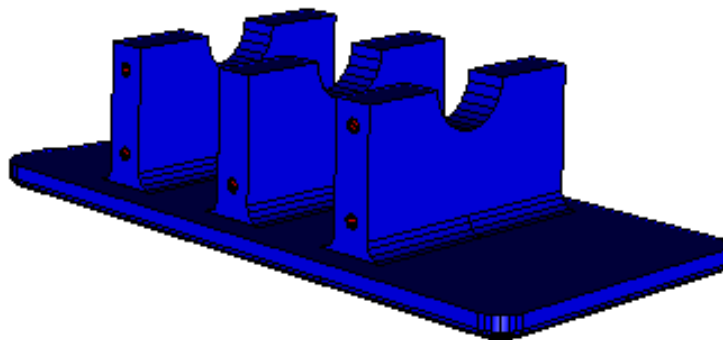
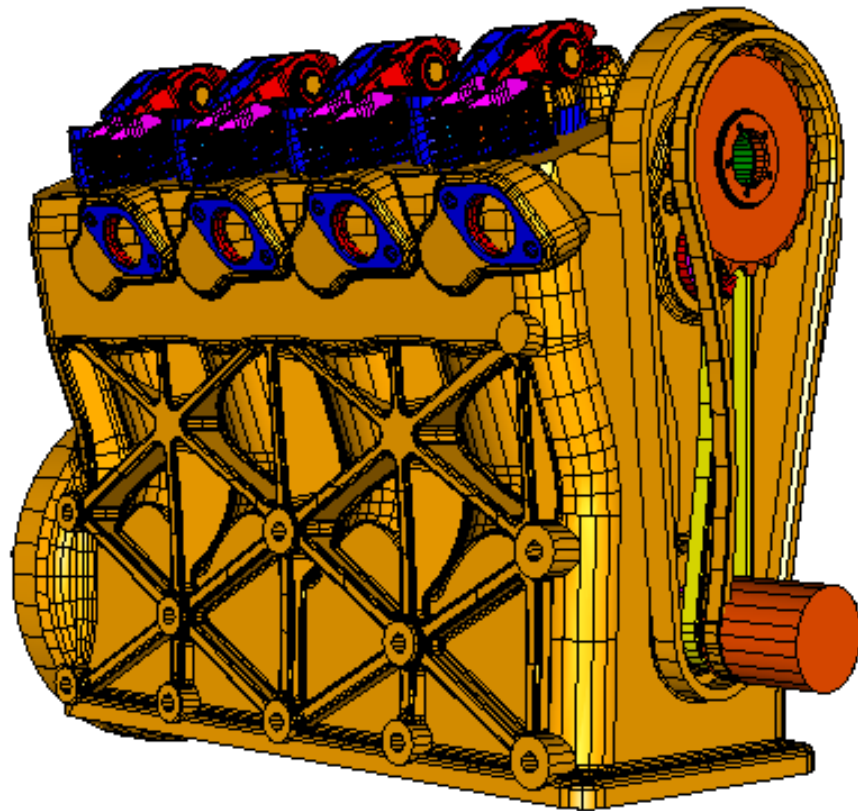
Install Balance Shaft Chain

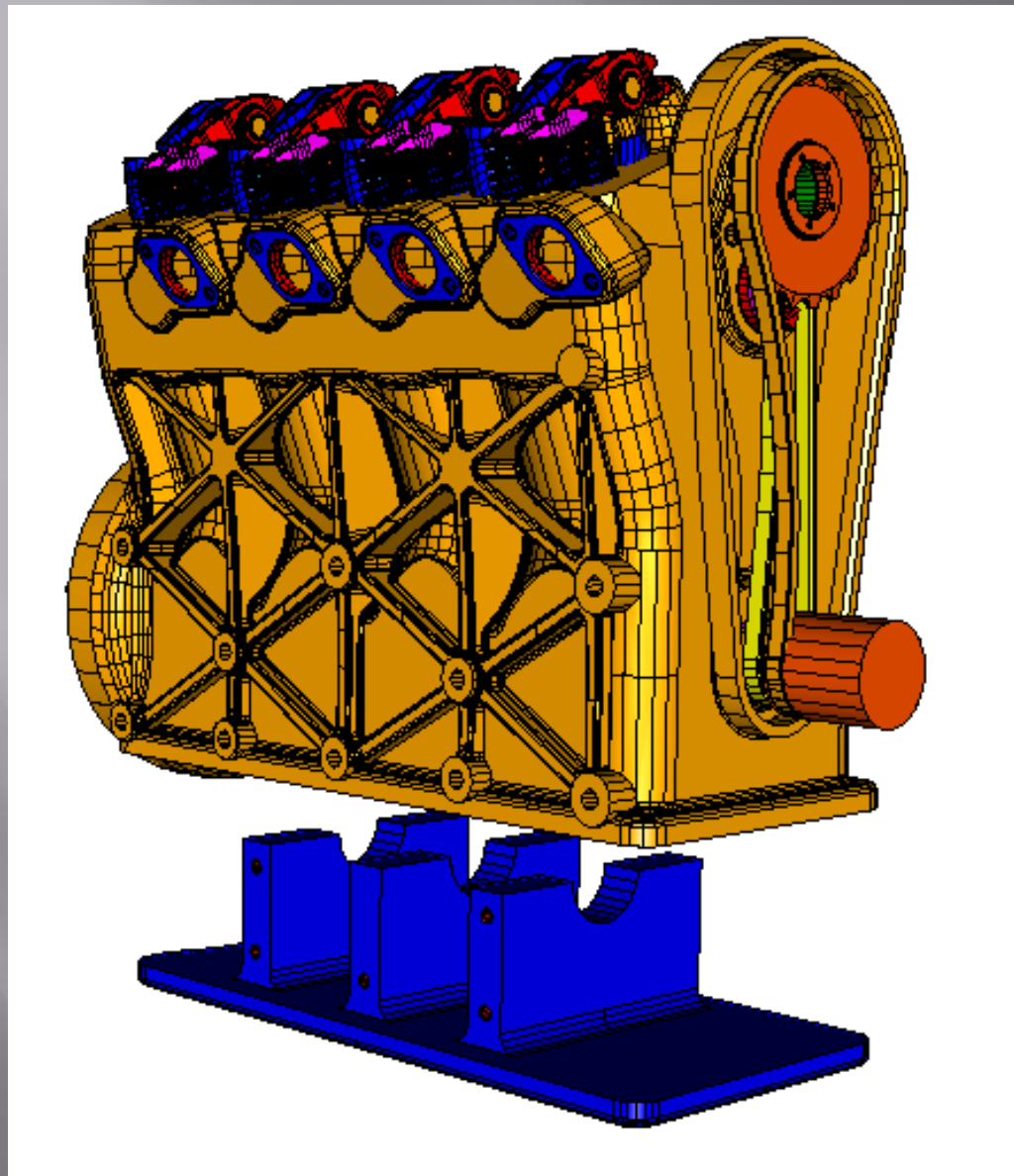


Then Cam Timing Sprocket & Chain



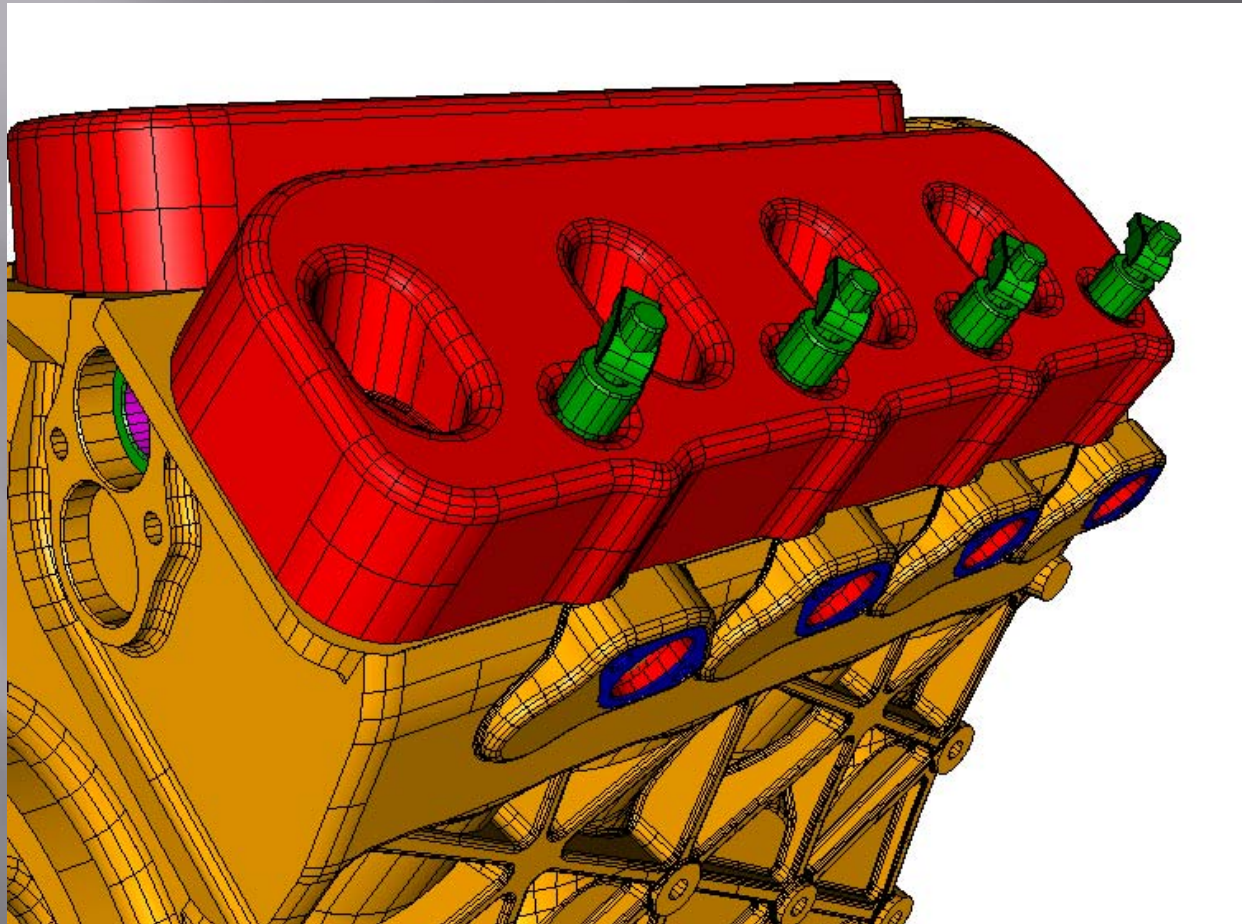
Install Bedplate





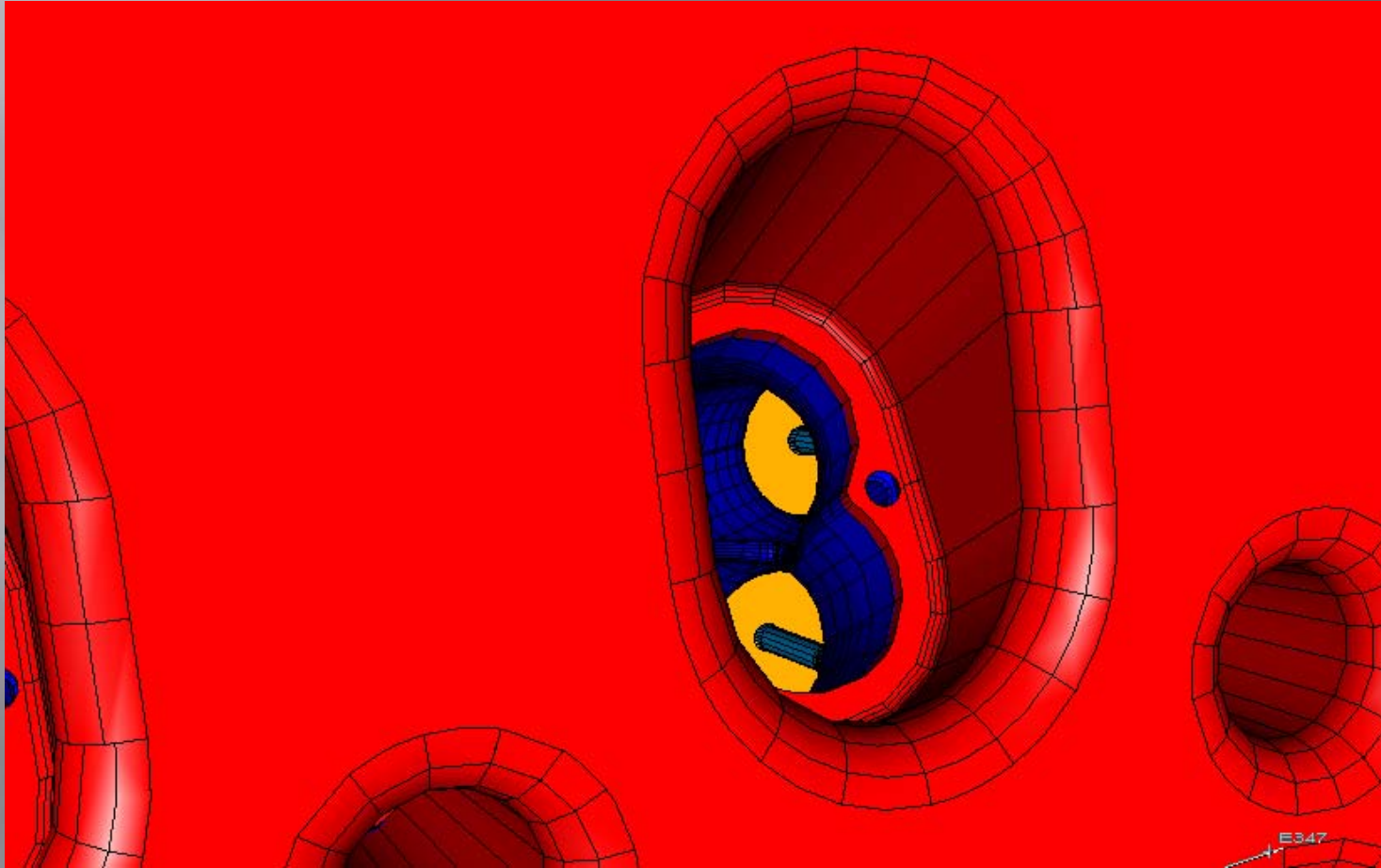
Note
Cross Bolt
Mains

Detail of Valve Cover



Those are Intake Ports in the Valve Cover

Yes, Those Are Intake Valves!



Having No Head Bolts Opens Things Up!

A detailed 3D CAD model of a mechanical assembly, possibly a pump or engine component. The model is rendered in a dark red color with blue and purple highlights on certain surfaces. It features a complex internal structure with various components like gears, shafts, and a large flywheel-like element on the right side. The text "Thank You!" is overlaid in the center of the image.

Thank You!

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