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TECHNICAL REPORT

Measurement of the combustion chamber of a cylinder head

ajusa

SCOPE

Explain **how to calculate the combustion chamber volume** in order to keep the same volume after a cylinder head grinding.

DESCRIPTION

When **its grinded a cylinder head**, the volume of the camera changes immediately (case where the chamber it's not flat), **changing the compression ratio and affecting the performance of the engine.**

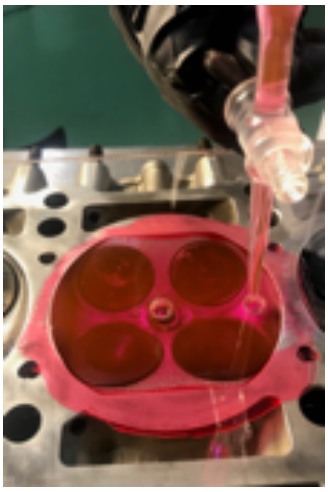
The **internal volume of the chamber should be measured** before and after grinding, to calculate the thickness of the gasket **needed to compensate that decrease in volume** and therefore maintain the same compression ratio inside the engine.

Being an irregular volume, there is no mathematical formula to calculate it. For this, the customer must measure the volume of the chamber in the following way:

1. Clean the surfaces of the cylinder head.
2. Seal the valves on the cylinder head seats.

3. **Place a flat methacrylate plate with a hole in the center**. The plate must be completely sealed against the plane of the cylinder head to avoid leakage. For this you can use any type of grease or sealant.

4. Insert a **hydraulic oil into the hole** using a burette to measure the volume.



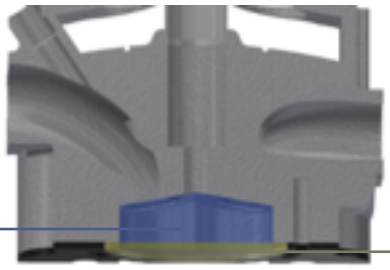
5. Measure the volume of oil that was introduced. This process is done before and after the grinding. We will subtract both volumes and the resulting value will be the volume that we must increase with the cylinder head gasket.

Symptoms of the engine in the case of varying the compression ratio in the combustion chambers:

- Increase fuel consumption
- Loss of compression and power
- Overheating
- Deformation of cylinder head / block
- Leakage of oil or coolant
- Knock of the valves with the base of the pistons

EXAMPLE:

Cylinder head + cylinder head gasket before



$Volume_{initial\ chamber} = 30\ cm^3$

$Thickness_{cylinder\ head\ gasket} = 0{,}12\ cm$

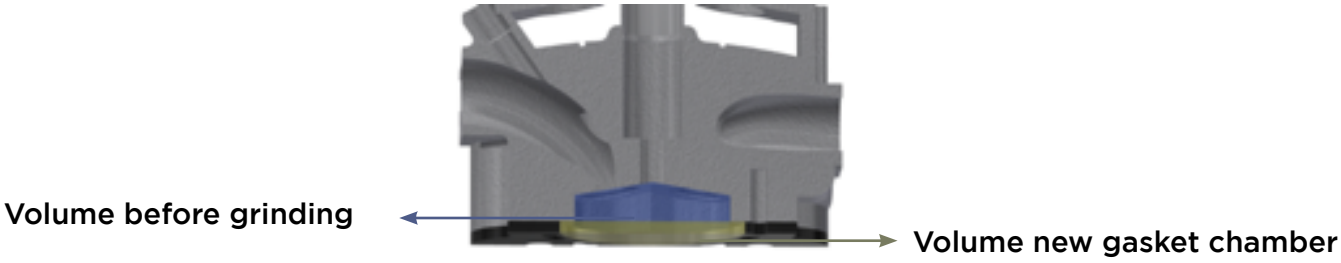
$Diameter_{cylinder\ head\ gasket} = 8{,}25\ cm$

$$Volume_{cylinder\ head\ gasket} = \pi * \frac{diameter_{cylinder\ head\ gasket}^{2}}{4} * thickness_{cylinder\ head\ gasket} = \pi * \frac{8{,}25^2}{4} * 0{,}12 = 6{,}415\ cm^3$$

$Volume_{initial} = 30\ cm^3 + 6{,}415\ cm^3 = 36{,}415\ cm^3$

Cylinder head + gasket after grinding

Cylinder head gasket with greater thickness to compensate the loss of volume of the camera.



- $Volume_{chamber\ after\ grinding} = 27{,}3\ cm^3$ obteined in step 5
- $Volume_{new\ cylinder\ head\ gasket} = 36{,}415\ cm^3 - 27{,}3^3 = 9{,}115\ cm^3$

$$Volume_{new\ cylinder\ head\ gasket} = \pi * \frac{diameter_{cylinder\ head\ gasket}^{2}}{4} * thickness_{new\ cylinder\ head\ gasket}$$

$$9{,}115\ cm^3 = \pi * \frac{8{,}25^2}{4} * thickness_{cylinder\ head\ gasket} \rightarrow thickness_{new\ cylinder\ head\ gasket} = 0{,}17\ cm$$

CONCLUSION

After grinding the cylinder head and reducing the volume of the chamber from 30 cm^3 to 27.3 cm^3, we must replace the cylinder head gasket with 0.12 cm thickness with a **0.17 cm gasket.**

(This is a fictitious example)