ICHKI YONUV DVIGATELLARI NAZARASI

(Theory of Internal Combustion Engines)

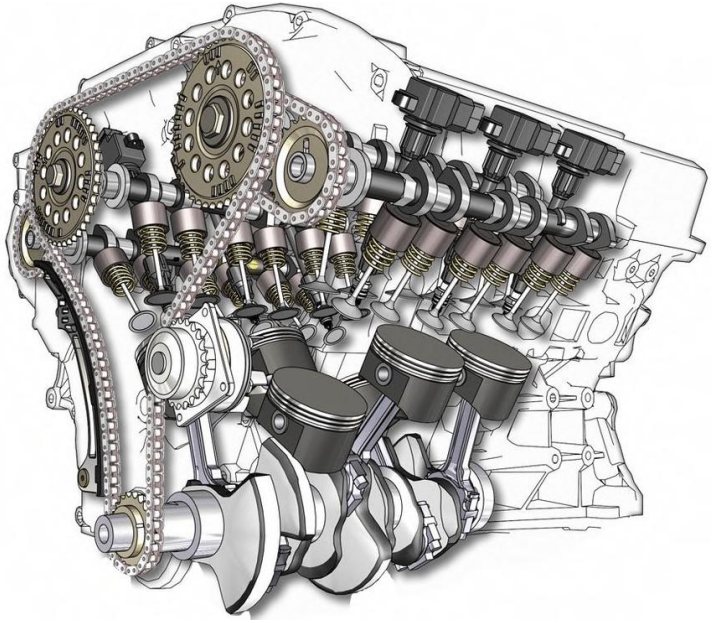

Photo source: https://www.researchgate.net/figure/Illustration-of-a-V6-internal-combustion-engine_fig1_339612888

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Topic 1: Introduction. Relevance of the course. The origins, classification of internal combustion engines

1-Ma`ruza: Kirish. Fanning ahamiyati. Ichki yonuv dvigatellarining tarixi va rivojlanishi, tasniflari.

Reja:

1. Fanning maqsad va vazifasi
2. Avtomobil dvigateli haqida tushuncha
3. Ichki yonuv dvigatellarining rivojlanish tarixi
4. Ichki yonuv dvigatellarining turlari
5. Ichki yonuv dvigatellarining ko`rsatkichlari

Fanning maqsad va vazifasi

Photo source:
https://www.autonews.com/article/20181112/OEM06/181119968/amid-ev-hype-the-internal-combustion-engine-keeps-improving

Fanning maqsadi - Avtotransport vositarining ichki yonuv dvigatellari bo'yicha chuqur bilim va ko'nikmalarga ega bo'lgan oliy ma'lumotli muhandis kadrlar tayyorlash;

Fanining asosiy vazifasi - talabalarga ichki yonuv dvigatellari silindrlari ichida sodir bo`ladigan jarayonlarni yuzaga kelishi, ularning qonunlari, ko`rsatkichlarini aniqlash, dvigatelni asosiy o`lchamlarini va iqtisodiy ko`rsatkichlarini aniqlash, kabilarni o`qitishdan iborat.

Ichki yonuv dvigateli haqida tushuncha

Ichki yonuv dvigateli (IYOD) bu yonilg‘ini yoqish hisobiga mexanik energiya hosil qilishga mo‘ljallangan issiqlik mashinasi tushuniladi. Bunda yonilg‘ining yonishida issiqlik ajralib chiqishga olib keluvchi kimyoviy reaksiyalar va ajralgan issiqlikning mexanik ishga aylanishi sodir bo‘ladi. Shu orqali silindr ichida porshen xarakatga keladi.

Shu sababli transport vositalarida foydalaniladigan ichki yonuv dvigatellari porshenli dvigatellar deb ataladi.

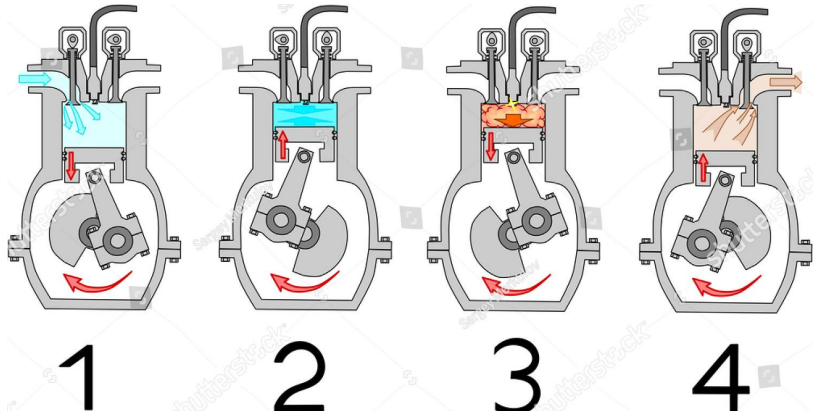

Photo source: https://www.shutterstock.com/ru/image-vector/4-stroke-internal-combustion-engine-diagram-555576940

Ichki yonuv dvigateli haqida tushuncha

Hozirgi zamon transport vositalariga (avtomobil, yo`l qurish mashinalari) kuch agregatlari sifatida asosan **porshenli ichki yonuv dvigatellari o`rnatiladi**.

Ichki yonuv dvigatellarida asosan suyuq va gaz holatidagi yonilg`ilar ishlatiladi. Ichki yonuv dvigatellari (IYoD) ixchamligi, ishonchliligi va yonilg`ini kam sarflashi bilan boshqa dvigatellardan ustun turadi [1].

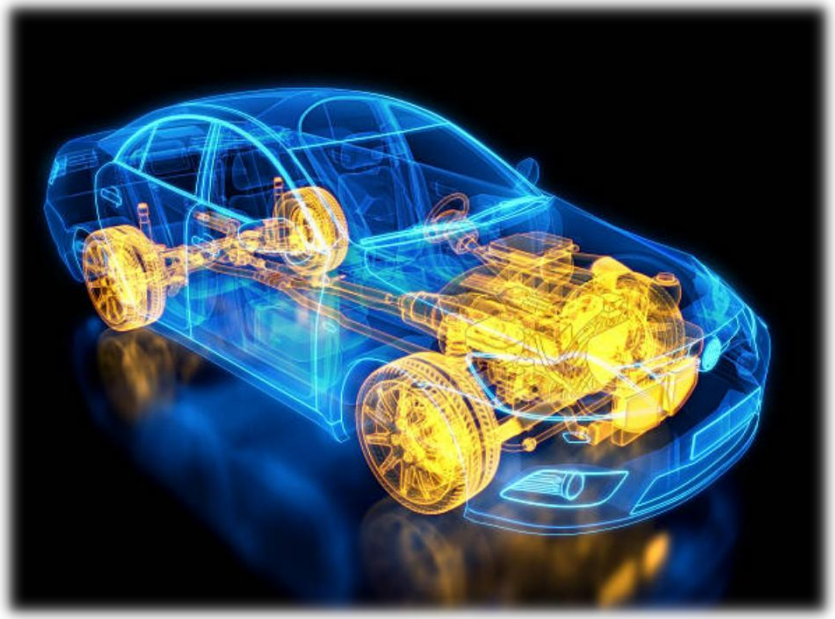

Photo source: https://www.gettyimages.com/detail/photo/car-and-chassis-x-ray-blueprint-royalty-free-image/182154020?adppopup=true

Faktlar

- ✓ Eng ko‘p tarqalgan issiqlik dvigatellari- bu ichki yonuv dvigatellardir.
- ✓ Dunyo bo‘yicha ishlab chiqarilayotgan quvvatning 80 foizi ichki yonuv dvigatellar xissasiga to‘g‘ri keladi [1].
- ✓ Ichki yonuv dvigatellarning ixchamligi, mustaxkamligi, chidamliligi va tejamkorligi uchun halq xo‘jaligining xamma soxalarida qo‘llanilmoqda.

Faktlar

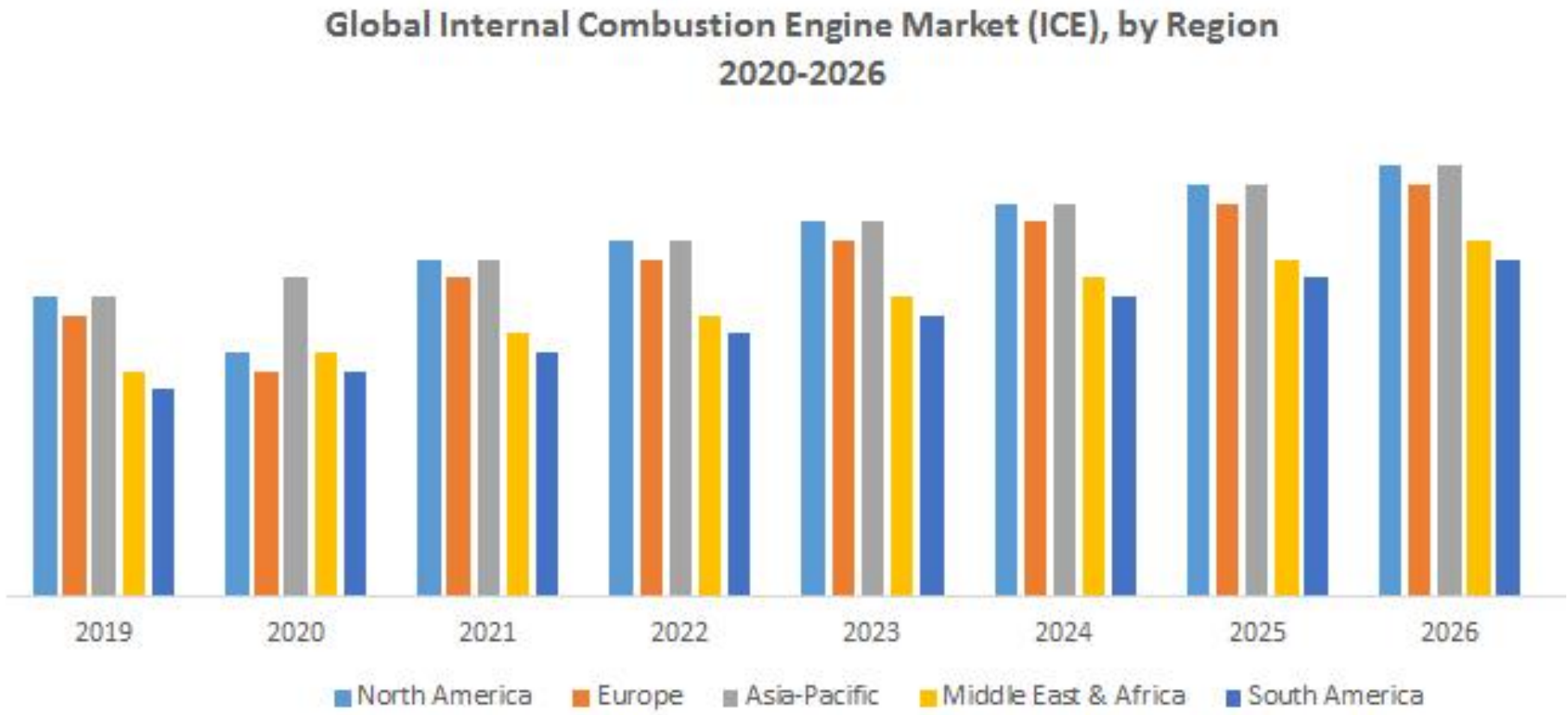

Photo source: https://www.maximizemarketresearch.com/market-report/global-internal-combustion-engine-market/23024/

Faktlar

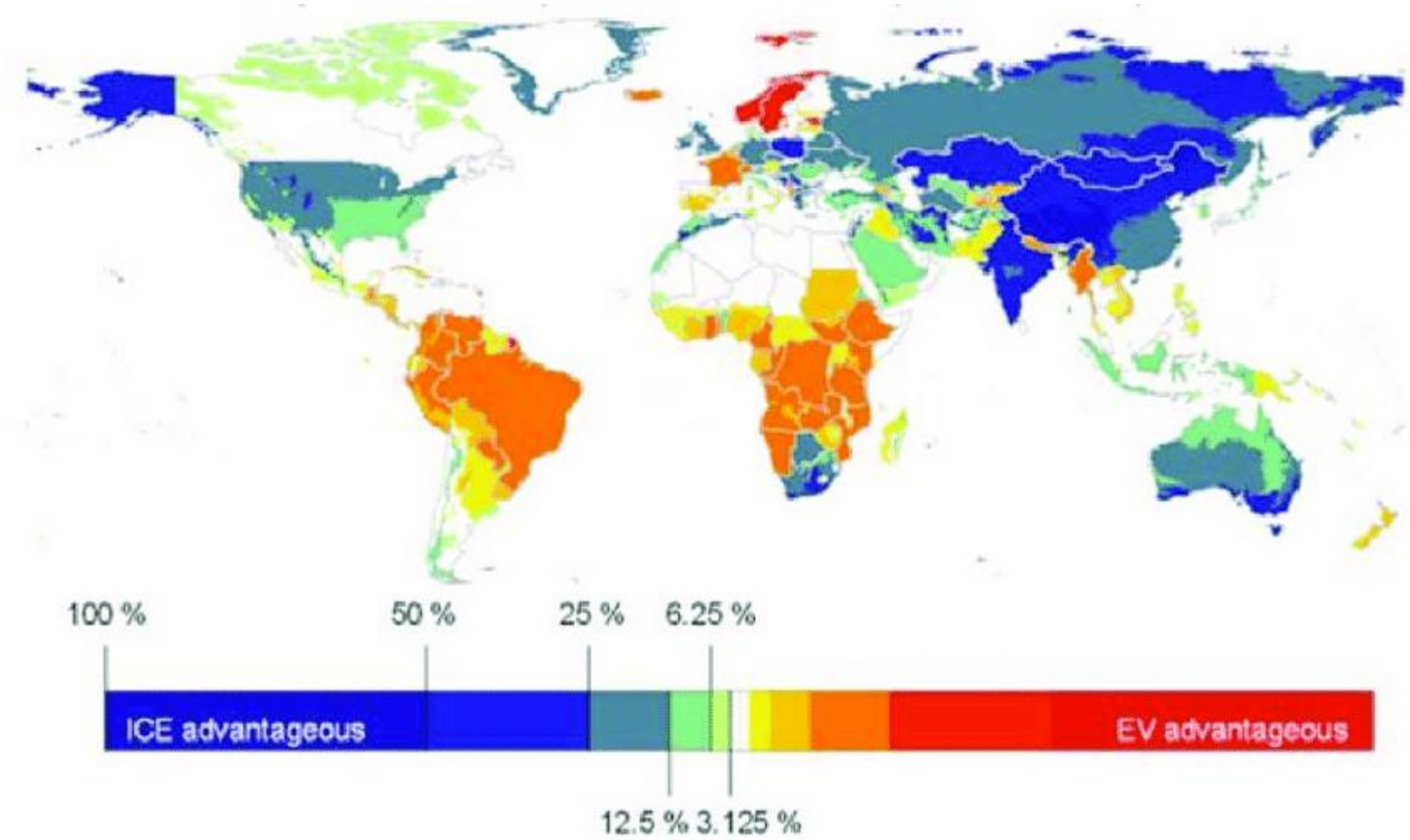

Photo source: https://www.researchgate.net/figure/World-repartition-of-countries-where-petrol-driven-internal-combustion-engine-vehicles_fig6_338078015

Ichki yonuv dvigatellari tarixi.

Dastlabki porshenli ichki yonuv dvigatelli 1860 yilda frantsuz injineri Ete`n Lenuar tomonidan yaratilgan. Bu dvigatel ikki taktli gazli dvigatel bo‘lib, taqsimlash mexanizmi zolotnikli bo‘lgan, havo-yoqilgi aralashmasi tashqi manba energiyasi orqali yondirilgan, yoqilg‘i sifatida yorug‘lik beruchi gaz (svetilniy gaz) ishlatilgan [2].

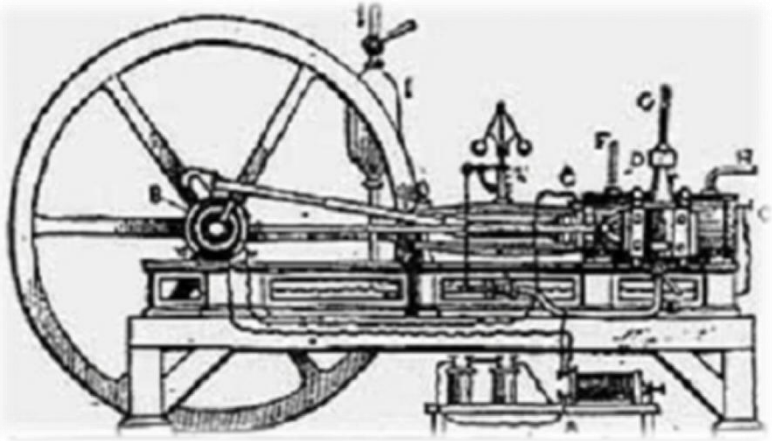

Photo source: https://en.wikipedia.org/wiki/%C3%89tienne_Lenoir

Ichki yonuv dvigatellari tarixi.

1876 yili nemis konstruktori Nikolas Otto 4 taktli gazda ishlaydigan dvigatel yaratdi. Bu dvigatelda yonish oldidan aralashma siqilgan bo‘ladi, buning natijasida dvigatelning tejamkorligini Lenuar dvigateliga qaraganda oshirishga imkon berdi. Ottoning dvigateli sanoatda keng ishlatilgan [3].

Photo source: https://en.wikipedia.org/wiki/Nicolaus_Otto

Ichki yonuv dvigatellari tarixi.

1899 yilga kelib hozirgi zamon dizelining dastlabki **sanoat namunasi** ishlab chiqildi. Shuni ta`kidlash lozimki, bu dvigatel prototipi nemis muhandisi Rudolf Dizel tomonidan 1897 yilda yaratilgan bo`lib, kerosinda ishlaydigan dvigateldan ancha tejamli ishlar edi [2].

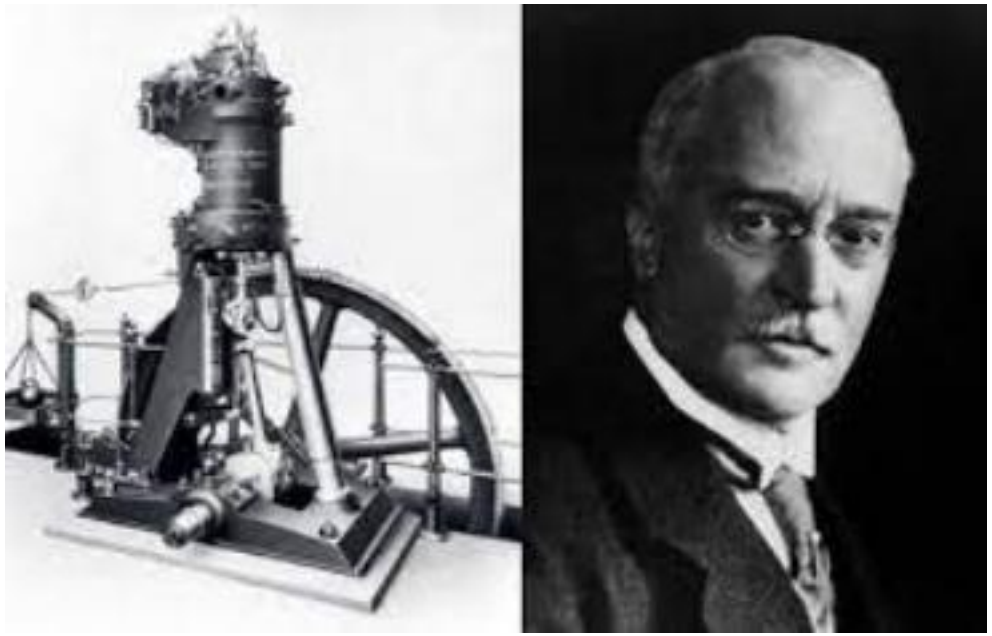

Photo source: https://www.autodoc.co.uk/info/diesel-engine-essentials

“Dizel” deb atalgan bu dvigatelda yonish jarayoni siqilgan havo muhitida purkalgan yonilg`ining o`z-o`zidan alangalanishi natijasida sodir bo`ladi. Karbyuratorli dvigatellarga nisbatan dizellar yonilg`ining sarfi jihatida tejamli bo`lgani uchun, hozirgi kunda ular barcha transport vositalariga o`rnatilmoqda.

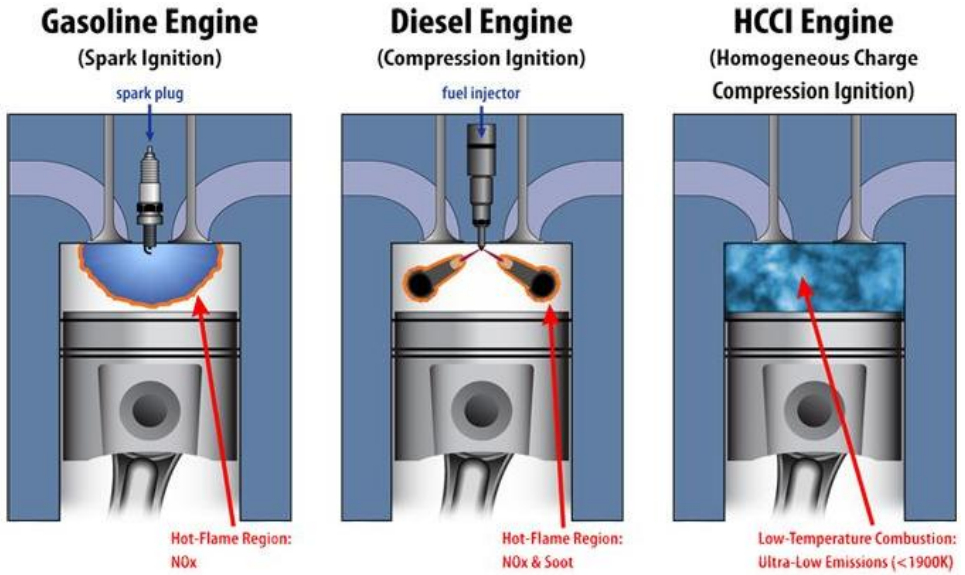

Photo source: https://www.semanticscholar.org/paper/Homogeneous-Charge-Compression-Ignition-Engines-Awate-Bhangare/b36d9802435268bef13987e978771e6b8409b2d4

Porshenli IYoD quyidagi belgilarga qarab tasniflanadi.

Tuzilishiga qarab:

- Porshenli
- Rotor- porshenli.
- Gaz trubinali
- Kombinatsiyalashgan.

Photo source: https://www.istockphoto.com/photo/piston-ignition-time-of-car-engine-gm1177695005-328881557

Photo source: https://rotronpower.com/

Photo source: https://energyeducation.ca/encyclopedia/Gas_turbine

Vazifasiga qarab:

- Statsionar sharoitda ishlaydigan dvigatellar;
- Transport dvigatellar (Traktor, avtomobil va boshka transport vositasila ishlatiladigan);

Qo‘llanidigan yonilg'iga qarab:

- yengil suyuq yonilg'ida (benzin, benzol, kerosin, ligroin va spirtda).
- ogir suyuq yonilg'ida (mazut, solyar moyi, dizel yonilg’isi va gazoylda).
- gaz yonilg'ida (generator gaz, tabiiy gaz, sikigan yoki suyultirilgan gazda).
- Aralash yonilg'ida (asosiy yonilg’i gaz bo‘lib, dvigatelni yurgizishda suyuq yonilg’ida).

Ishchi siklni amalga oshirilishiga qarab:

- To‘rt taktli.
- Ikki taktli.

Tsilindrlar soniga qarab:

- Bir silindrli .
- Ko‘p (ikki va undan ortiq) silindrli.

Tsilindrlarining joylashtirilishiga qarab:

- Vertikal bir qator.
- Gorizontal bir qator.
- V- simon joylashtirilgan.
- Yuldo‘zsimon joylashtirilgan.
- Karama- karshi joylashtirilgan.

Sovutish usuliga qarab:

- suyuqlik bilan.
- havo bilan.

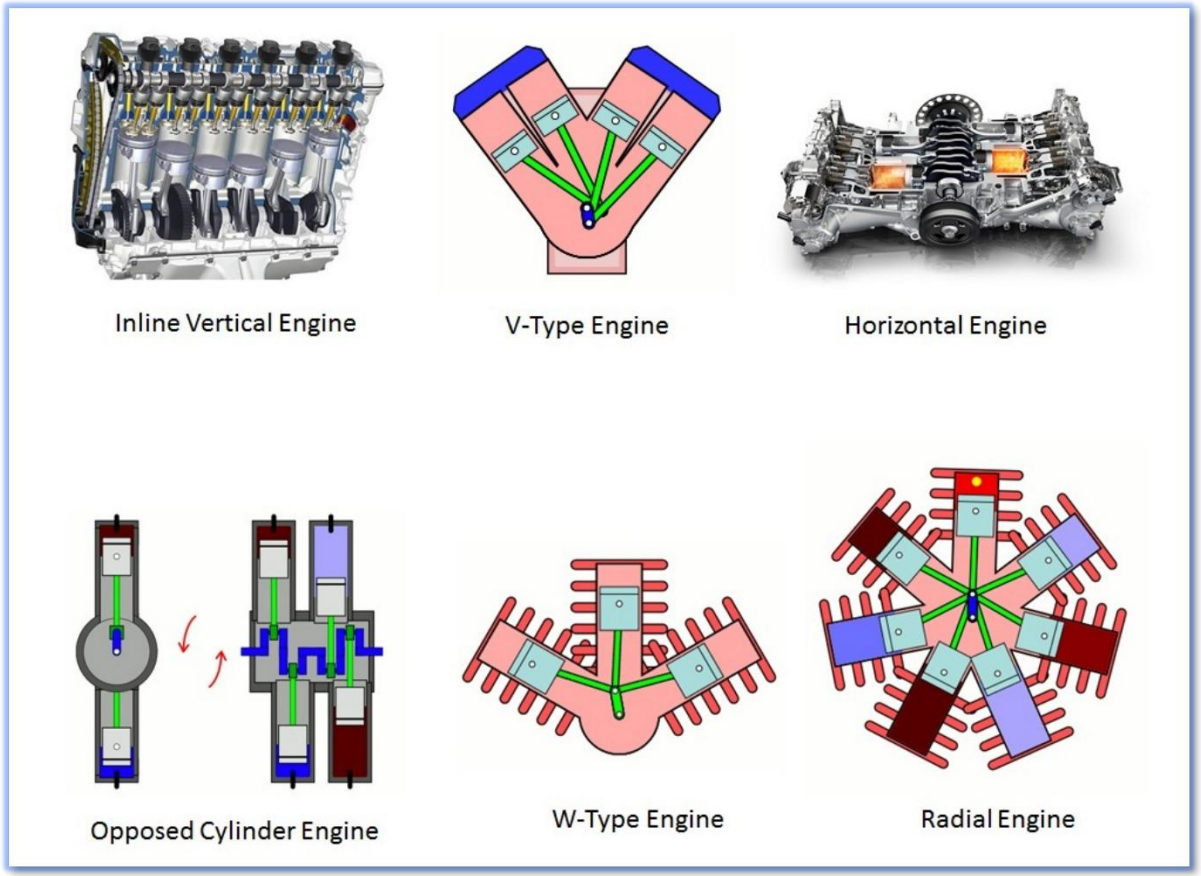

Photo sourse: https://www.mechanicalbooster.com/2016/08/different-types-of-engine.html

Yonuvchi aralashma xosil bo‘lishiga qarab:

- Aralashmasi silindrdan tashqarida tayyorlanadigan karbyuratorli va gaz dvigatellari.
- Aralashmasi silindr ichida tayyorlanadigan dizel va injektorli dvigatellari.

Photo source: https://tmpekar.ru/catalog/toplivnaya-sistema/karbyuratory-dlya-avtomobiley-i-avtobusov/k177-2107-1107010/

Aralashmani alangalatish usuliga qarab:

-Elektr uchquni bilan alangalaydigan karbyuratorli va gaz dvigatellar

- Siqilishdan qizigan qavo yordamida o‘z- o‘zidan alangalaydigan dizel dvigatellari.
- Forkamerali- alanga bilan alangalaydigan dvigatellar.

Photo source: https://www.holley.com/products/fuel_systems/fuel_injection/injectors/fuel_injectors_-_high_impedance/parts/522-368

Dvigatelning ko’rsatkichlari

Silindrning ishchi hajmi-V_h, porshen yu.ch.n. dan p.ch.n. gacha harakatlanganda hosil bo‘lgan hajmi. U quyidagi ifoda bilan aniklanadi:

$$V_h = \frac{\pi d^2}{4} \cdot S(м^3),$$

bu yerda d-porshen diametri,

Siqish bo‘linmasining hajmi (siqish kamerasi) porshen yu.ch.n. da turganda uning yuqorida hosil bo‘lgan hajm. U V_c xarfi bilan belgilanadi. Silindrning to‘la hajmi V_a silindrning ishchi hajmi V_h bilan qisishish bo‘linmasining hajmi V_c ning yigindisiga teng, yahni:

$$V_a = V_h + V_c \left(м^3\right),$$

[1]

Dvigatelning ko’rsatkichlari

Silindrning to‘la hajmini siqish kamerasining hajmiga nisbati qisish(siqish) darajasi deb ataladi va quyidagicha aniqlanadi:

$$\varepsilon = \frac{V_a}{V_c} = \frac{V_h + V_c}{V_c} = \frac{V_h}{V_c} + 1,$$

Qisish darajasining miqdori karbyuratorli dvigalellar uchun ε 6,5-10; dizel dvigatellar uchun ε 12-22.

Dvigatel litraji ko‘p silindrli dvigatellarda barcha silindrlarning litrlarda ifodalangan ish hajmlari yig‘indisidan iborat:

$$V_л = 10^{-3} V_h i,$$

bunda i-silindrlar soni, V_h-bitta silindrning ish hajmi.

[1]

IYODlarni rivojlantirish istiqbollari

- ✓ Ishlab turgan silindrlarning sonini yuklanishiga qarab avtomatik ravishda o`zgartirib turuvchi dvigatel yaratish ustida ilmiytadqiqot ishlari olib borilmoqda;

- ✓ Yoqilg`i sifatida gaz va gaz kondensatorlaridan, suv, biogaz, spirt, efir, o`simlik moyi va ularning benzin va dizel yonilg`isi bilan aralashtirish ustida tadqiqtlar olib borilmoqda;

- ✓ dvigatelni tayyorlashda plastmassa, keramika kabi materiallardan foydalanish ustida ishlanmoqda;.

Foydalanilgan adabiyotlar

1. Кодиров С.М., Автотрактор двигателлари - Тошкент, “Toshkent Tezkor bosmaxonasi”, 2010. — 572 б.
2. Lukanin V.N. va boshq. Ichki yonuv dvigatcllari.-T.: “Turon-Iqbol”, 2007- 608 b.
3. S.M. Kadirov, N.K. Paswan, Internal combustion engines. APH Publishing Corporation. New-Delhi-110002.2013. 459p.
4. 4. Колчин А.И., Демидов В.Л. Расчет автомобильных и тракторных двигателей. Высш.шк. 2008, - 340 с.

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