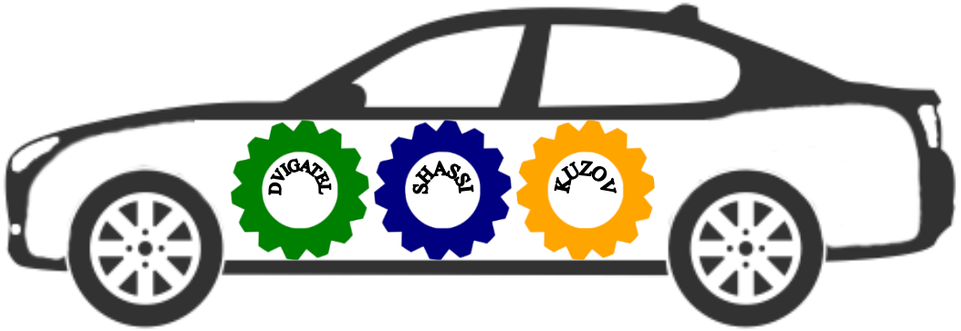
# VEHICLES CONSTRUCTION

# AVTOMOBILLAR KONSTRUKSIYASI




## 5th Topic: Cooling System

## (5-Mavzu: Sovutish tizimi)

## Part 1

**Associate Professor: Yusupov Sarvarbek**

# 5-Mavzu: Sovutish tizimi

(5th Topic: Cooling System)

**O‘quv rejasi:**

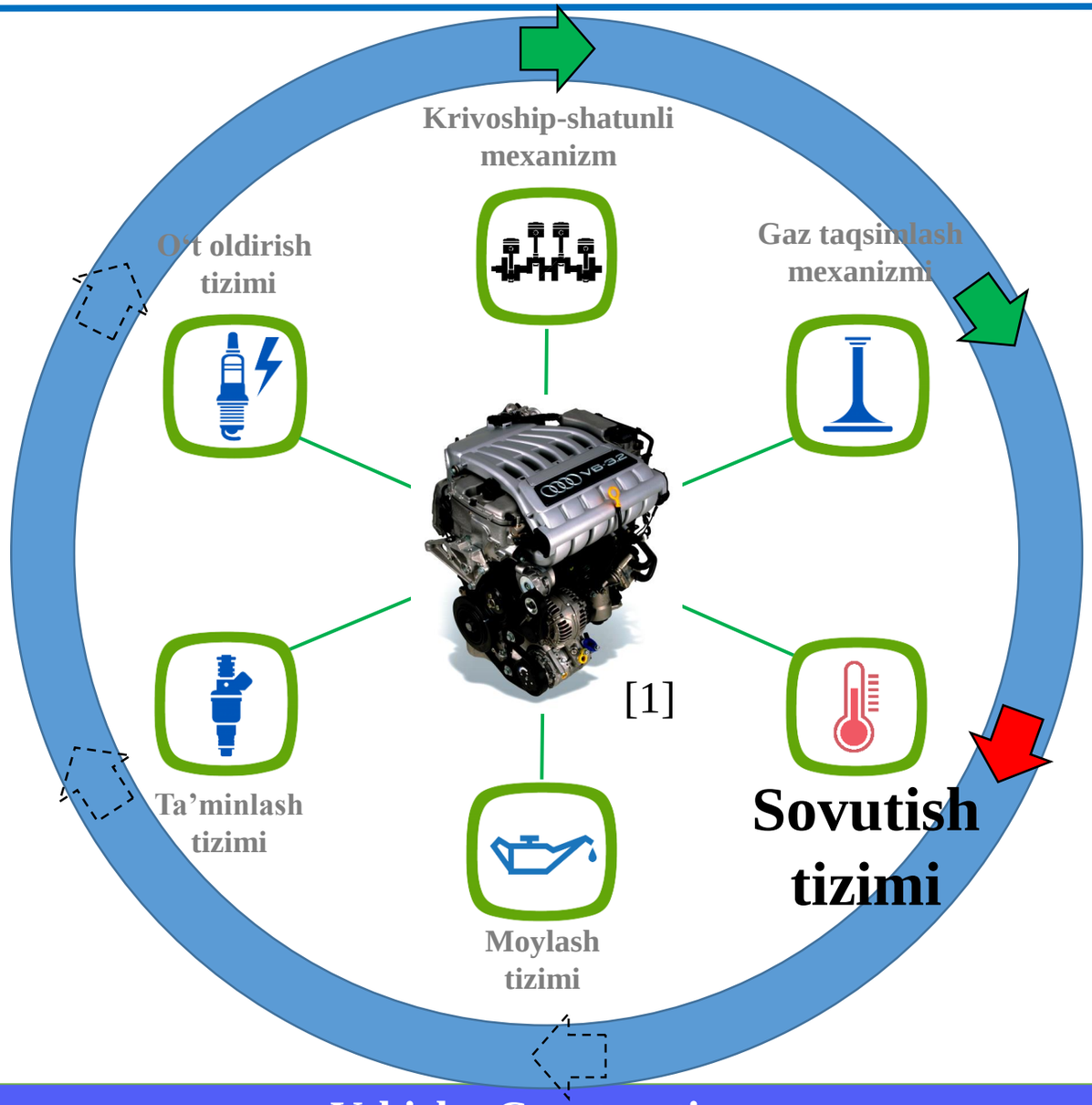
**5.1. Sovutish tizimining vazifasi va tasnifi.**

**5.2. Suyuqlik bilan sovutish tizimining konstruksiyasi.**

**5.3. Sovutish suyuqliklarining xususiyati.**

**5.4. Suyuqlik bilan sovutish tizimi qismlarining konstruksiyasi.**

**5.5. Havo bilan sovutish tizimi.**



# 5.1. Sovutish tizimining vazifasi va tasnifi.

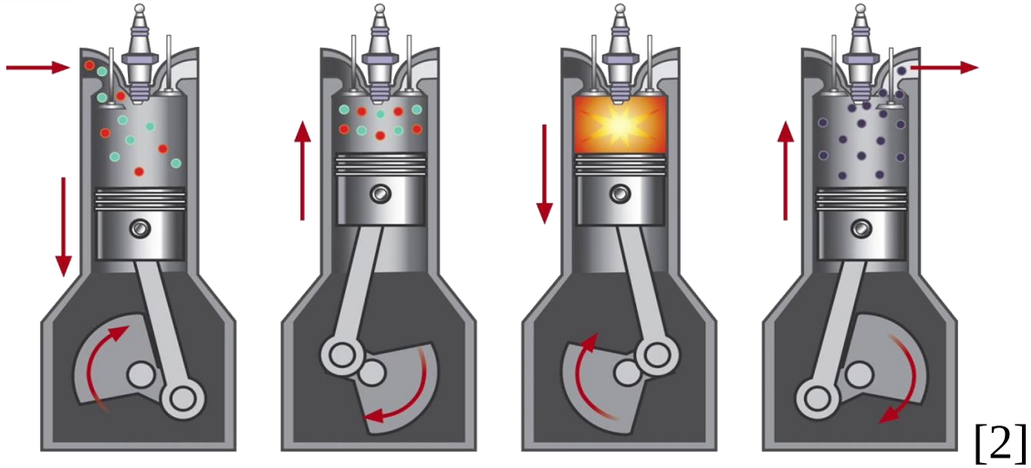
Kirish – yonilg‘i sifatida kimyoviy energiya

**100 %**


[1]

Chiqish – quvvat dvigatelning tirsakli valida hozil bo‘ladi

**20 %**



[2]

**Kiritish** **Siqish** **Kengayish (ish yo‘li)** **Chiqarish**

**Yonilg‘i isrofi** **25 %**

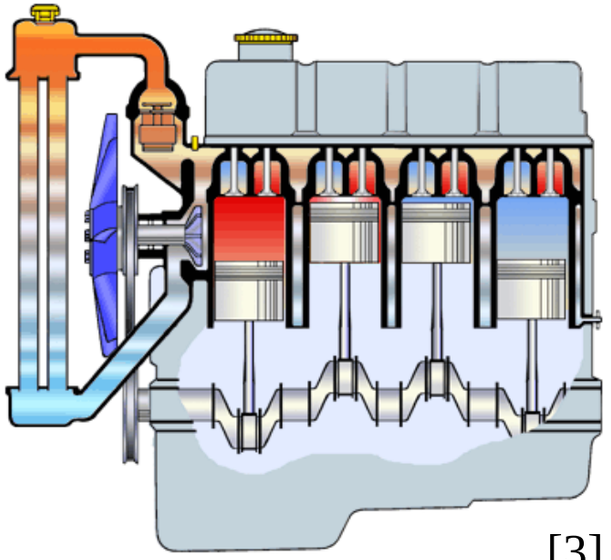
**Issiqlik isrofi** **35 %**

**Mexanik quvvat isrofi** **20 %**

**Umumiy yo‘qotish – 80 %**

Ish yo‘li taktida, to‘g‘ridan-to‘g‘ri yuqori haroratga ega gazlar ta’sirida bo‘lgan detallar (**silindrlar, silindrlar kallagi, porshenlar, klapanlar**) haddan tashqari qiziydi.

Yonilg‘ining silindrda yonishidan ajralgan **issiqlikning 10-35% i** dvigatel detallarining qizishiga sarflanadi.



[3]

Agarda detallardan **issiqlik tashqi muhitga** tarqatilmasa, unda harakatdagi detallarning ishqalanuvchi yuzalari orasidagi moy kuyib, ishqalanishni haddan tashqari orttirib yuboradi.

Ayniqsa, aluminiyli qotishmadan ishlangan porshenning qizishi va kengayishi oqibatida, uning silindr ichida qadalib qolishi xavfi ham tug‘iladi.

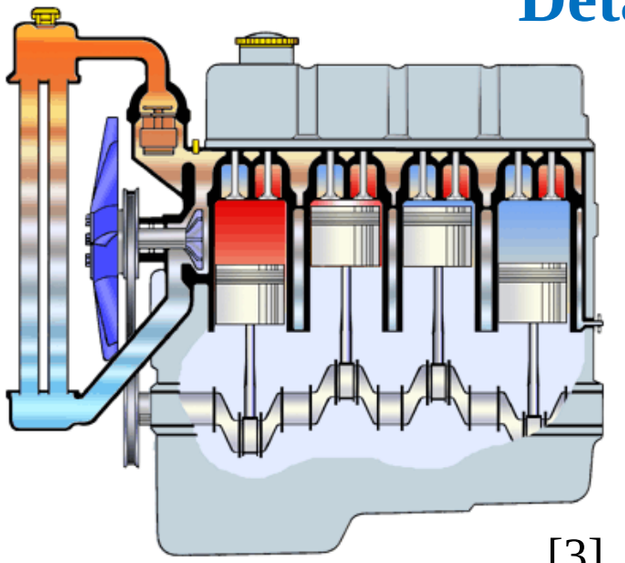
[4]

**Qiziganda:** **Dvigatel to‘la quvvat hosil qila olmaydi;**

**Yonilg‘i sarfi ↑;**

**Detallari yetarli darajada moylanmaydi;**

**Tez yeyiladi.**



[3]

[5]

**!** **issiqlik**ni uzluksiz ravishda **tashqi muhitga** tarqatib turish lozim.

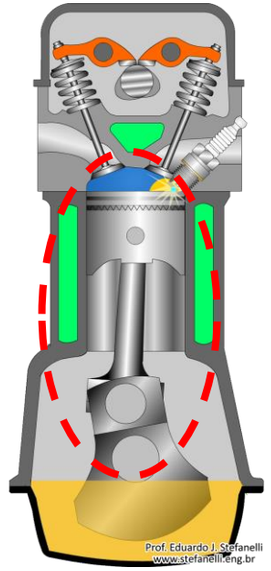
Dvigatel haddan tashqari sovitib yuborilsa ham issiqlik energiyasi bekorga sarf bo‘ladi.

moy quyuqlashib, ishqalanishga sarflanadigan quvvat ortadi.

Undan tashqari **yonuvchi aralashma** to‘liq bug‘lanmaydi,

qisman bug‘langanlari silindrning sovuq devorlariga urilib,

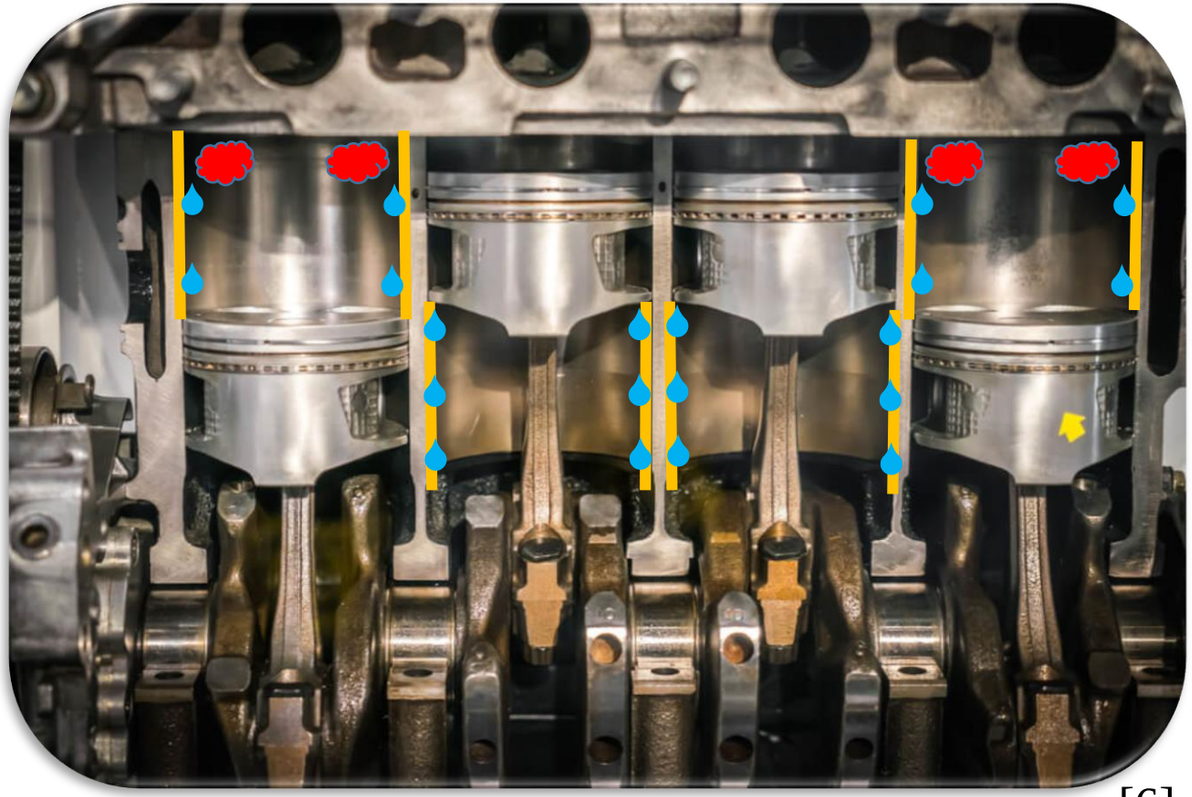
yonilg‘i tomchisiga aylanadi.




[7]

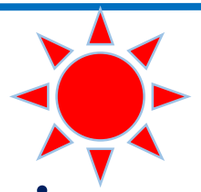
Devordagi moyni yuvib tushirib,

detallarining yeyilishi ortadi.



[6]

**karterdagi moyni suyultiradi.**

**Demak,** dvigatelning  juda qizib ketishi yoki haddan tashqari  sovib qolishi uning **effektiv quvvatini kamaytirib**, **yonilg‘i tejamkorligini yomonlashtiradi**.

**Vazifasi.**

**Sovitish tizimi** kuchli qizigan detallardan issiqlikning tarqatilishini **bir me’yorda saqlab**, dvigatelning optimal issiqlik rejimini saqlash uchun xizmat qiladi.

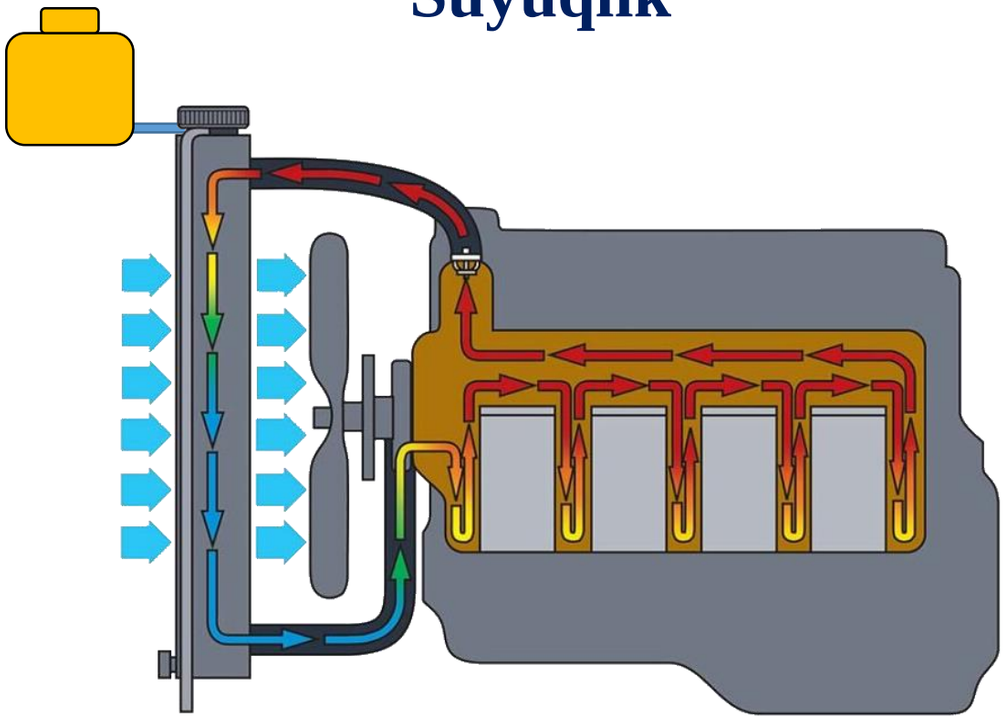
Shunda dvigatelning **yuqori quvvatga** va **yonilg‘i tejamkorligiga** ega bo‘lgan holda uzoq muddat ishlashi ta’minlanadi.

# Dvigatelda issiqlikni majburan tashqi muhitga tarqatish:

- **Suyuqlik**
- **Havo**

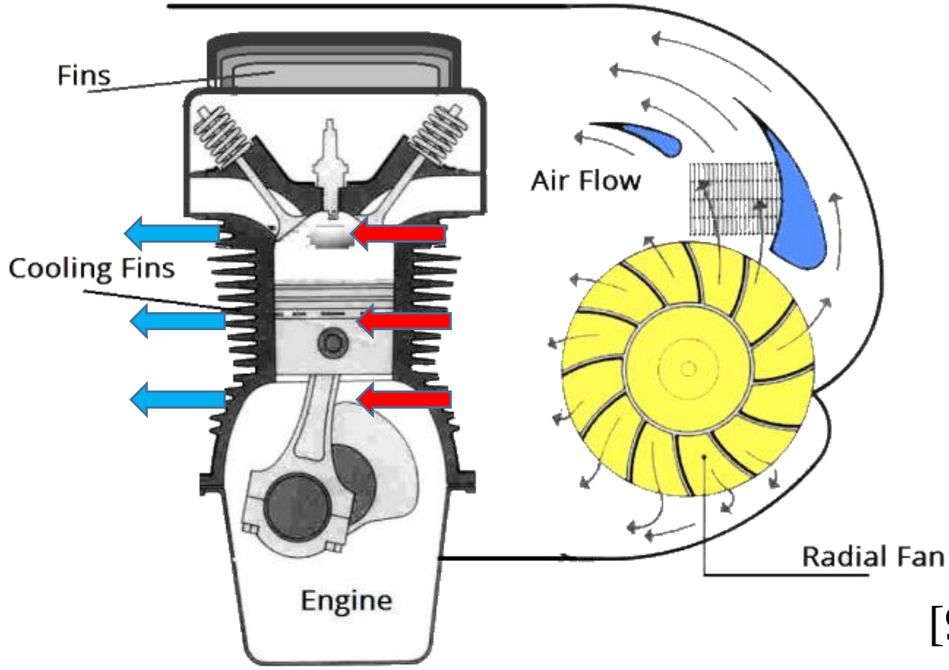
} bilan sovutish tizimi orqali amalga oshirilishi mumkin.

## Suyuqlik



[8]

## Havo




[9]

**Avtomobil dvigatelda asosan qo‘llaniladigan suyuqlik bilan sovutish tizimi havo bilan sovutish tizimiga nisbatan quyidagi afzalliklarga ega:**

1) Qo‘llaniladigan suyuqlikning qaynash harorati 370-380 K (**100-110°C**) bo‘lganligi sababli dvigatelning detallari **qattiq qizib ketmaydi**;

2) Sovutuvchi suyuqlik dvigateldan chiqayotgan **shovqin tovushini qisman yutadi**;

3) Tashqi muhitning harorat sharoiti past bo‘lganda, **dvigatelni yurgazish** nisbatan oson bo‘ladi va qizishi tezlashadi;

4) Bu turdagi dvigatelning **sovutish tizimi** qovurg‘alarining bo‘lmaganligi sababli **ixcham** bo‘ladi.

**Havo bilan sovutish tizimining o‘ziga xos xususiyatlari quyidagilar:**

1) Tizimda suyuqlik nasosi,

radiator,

suyuqlik kanallari,

thermostat

yo‘qligi sababli birmuncha yengil va **oddiy ishlangan**;

2) Dvigatelda suv g‘ilofi bo‘lmaganligi sababli tashqi muhit harorati past bo‘lganda, muzlab qolmaydi.

3) Suv yo‘q joylarda ham dvigatelni ishlatish mumkin.

# Sovutish tizimi quyidagilarni ta’minlashi lozim:

1. Dvigatelning ishlash rejimi va tashqi muhit sharoitidan qat’iy nazar optimal harorat rejimini avtomatik ravishda ushlab turish;

2. Dvigatelni ish rejimiga chiqishini qisqa muddatda ta’minlash;

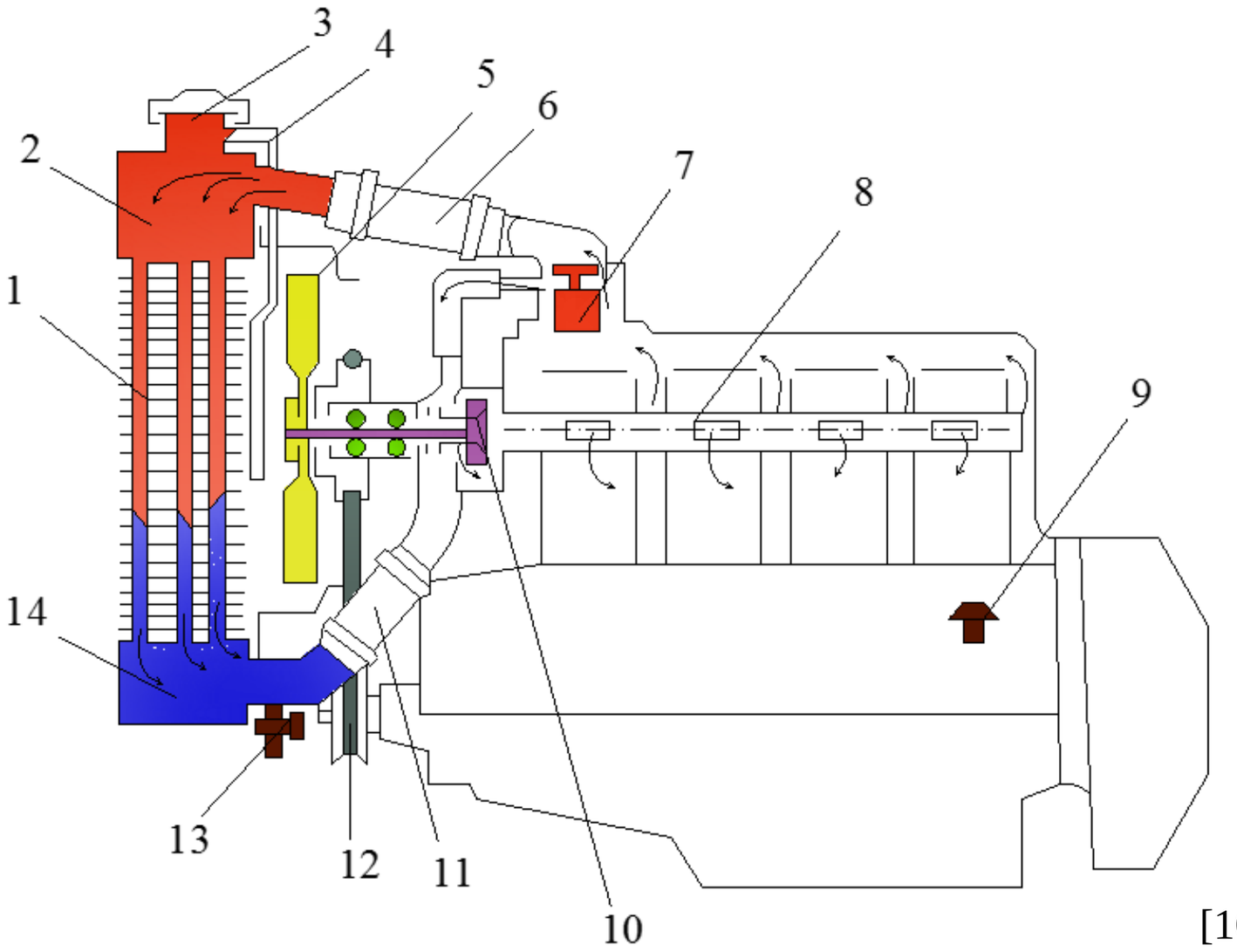
3. Dvigatel ishlashi to‘xtatilgandan so‘ng issiqlikni uzoq muddat saqlab turish;

4. Sovutish tizimi asboblarini yuritish bilan bog‘liq bo‘lgan energetik sarfini kamaytirish.

# 5.2. Suyuqlik bilan sovutish tizimining konstruksiyasi.

## Tuzilishi:

1-radiator, 2-radiatorning yuqori bachogi,
3-radiator qopqog‘i,
4-shamollatish shlangi, 5-ventilyator,
6-radiatorning yuqori shlangi,
7-termostat, 8-suyuqlik tarqatuvchi
markaziy kanal, 9-jo‘mrak,
10-suyuqlik nasosi, 11-radiatorning pastki
shlangi, 12-tasma, 13-jo‘mrak,
14-radiatorning pastki bachogi.




[10]

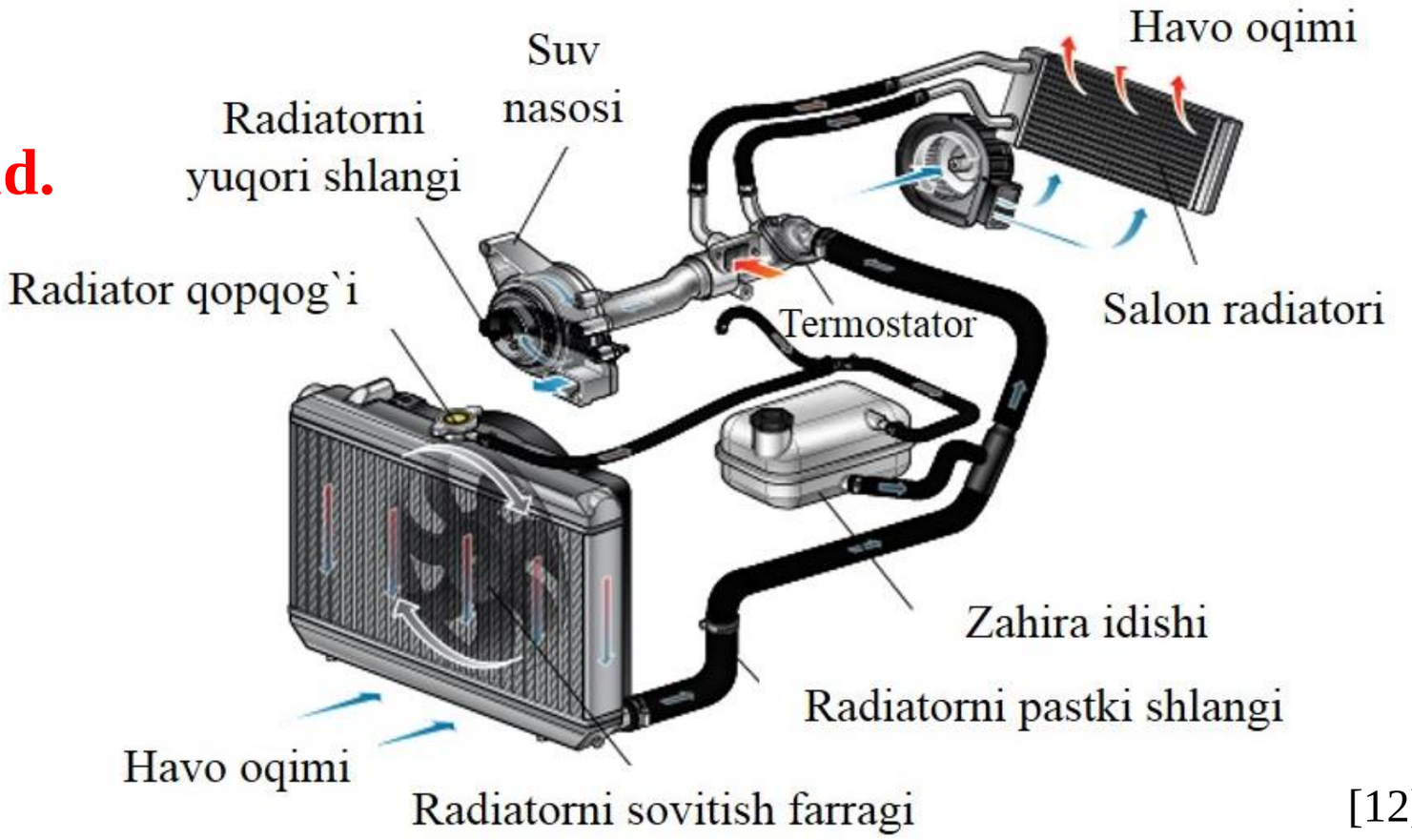
# Suyuqlik bilan sovutish tizimining ishlashi


[11]

# Suyuqlikning harakatnlanish usuli bo‘yicha:

- **Termosifon;**
- **Aralash;**
- **Majburiy tarmoqlar mavjud.**

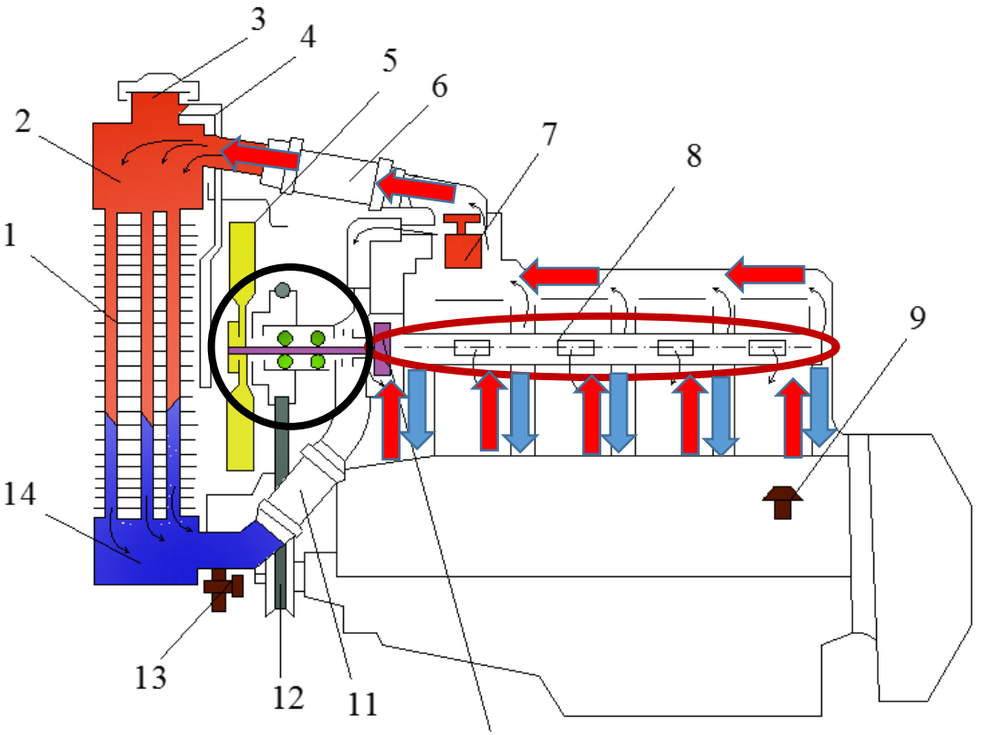



[12]

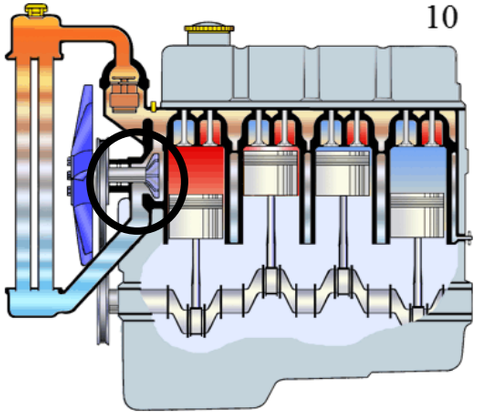
***Termosifon usulida*** suyuqlikning harakati issiq va sovuq suyuqliklar zichligining farqi tufayli tabiiy ravishda o‘tadi.

***Aralash usulda*** esa radiatordagi sovutilgan suv **nasos yordamida silindrlarning yuqori qismiga** yuboriladi, pastki qismiga esa suv o‘z tabiiy oqimi bilan oqib tushadi.

***Majburiy usulda*** tarmoqdagi **suyuqlik nasos** yordamida uzluksiz harakat qiladi.



[10]


[3]

# 5.3. Sovutish suyuqliklarining xususiyati.

Sovutish suyuqligi sifatida asosan suv ishlatiladi, chunki u issiqlikni o‘ziga tez oladi va o‘zidan tez tarqatadi, arzon va yetarli miqdorda.

[13]

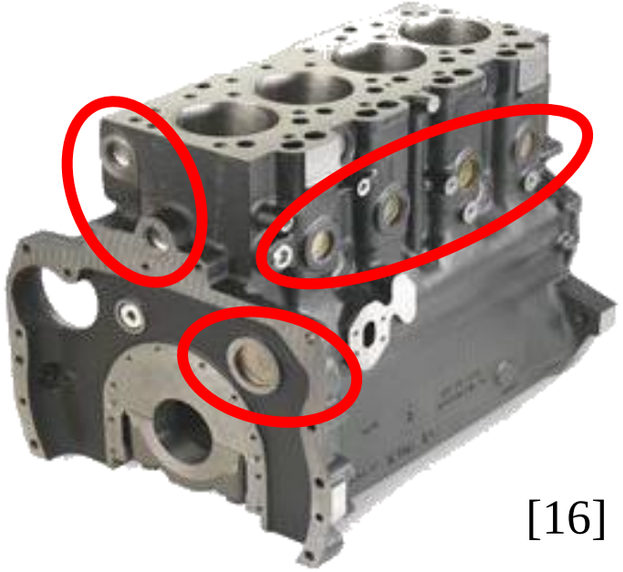
Lekin sovutish tizimida qaynagan suvning **quyqasi** (**nakip**) cho‘kib, **suv g‘ilofi devorlarida tuz qatlami hosil qiladi.**

Buning natijasida silindrlar blokining issiqlik o‘tkazish qobiliyati sustlashadi, suv g‘iloflarining devorlari zanglaydi.

[14]

Qish faslida tizimdan to‘kilmagan suv muzlab, silindrlar blokini yorib yuborishi mumkin.

[15]



[16]

Shuning uchun sovutuvchi suyuqlik sifatida, yuqorida aytib o‘tilgan kamchiliklardan xoli bo‘lish uchun **ANTIFRIZ** suyuqligidan keng foydalanilmoqda.

## **ANTIFRIZNING ikki xili ishlab chiqariladi:**

[17]

- tarkibi **47%** **suv** va **53%** **etilen-glikol** bo‘lgan antifriz M-40

(muzlash harorati **- 40°C**).

- **34%** **suv** va **66%** **etilen-glikol**dan tashkil topgan antifriz M-65

(muzlash harorati **- 65°C**).

**Antifriz kishi organizmi uchun zaharli hisoblanadi.**

**Uning issiqlik sig‘imi suvnikiga nisbatan kam.**

Shuning uchun sovutuvchi suyuqlik sifatida **antifriz** qo‘llanilganda tizimning issiqlik tarqatish qobiliyati suv bilan sovutilgandagiga nisbatan past bo‘ladi.

Natijada silindrlar devorining harorati **15-20°C ga ortiqroq qiziydi.**

**Antifriz qiziganda suvga nisbatan birmuncha ko‘proq kengayadi.**

Tizimda suyuqlik sifatida suv ishlatilganda **yomg‘ir** yoki **qor** suvlaridan foydalanish tavsiya etiladi, chunki **bu suvlar yumshoq** xususiyatga ega.

Sovutuvchi suyuqlik sifatida **quduq**, **buloq** yoki **dengiz** suvlaridan foydalanish tavsiya etilmaydi.

Bunday suvlarni yumshatish uchun **30-40 daqiqa** **qaynatiladi** va tizimga quyishdan avval **besh-olti qavat dokadan** o‘tkazib filtrlanadi.

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