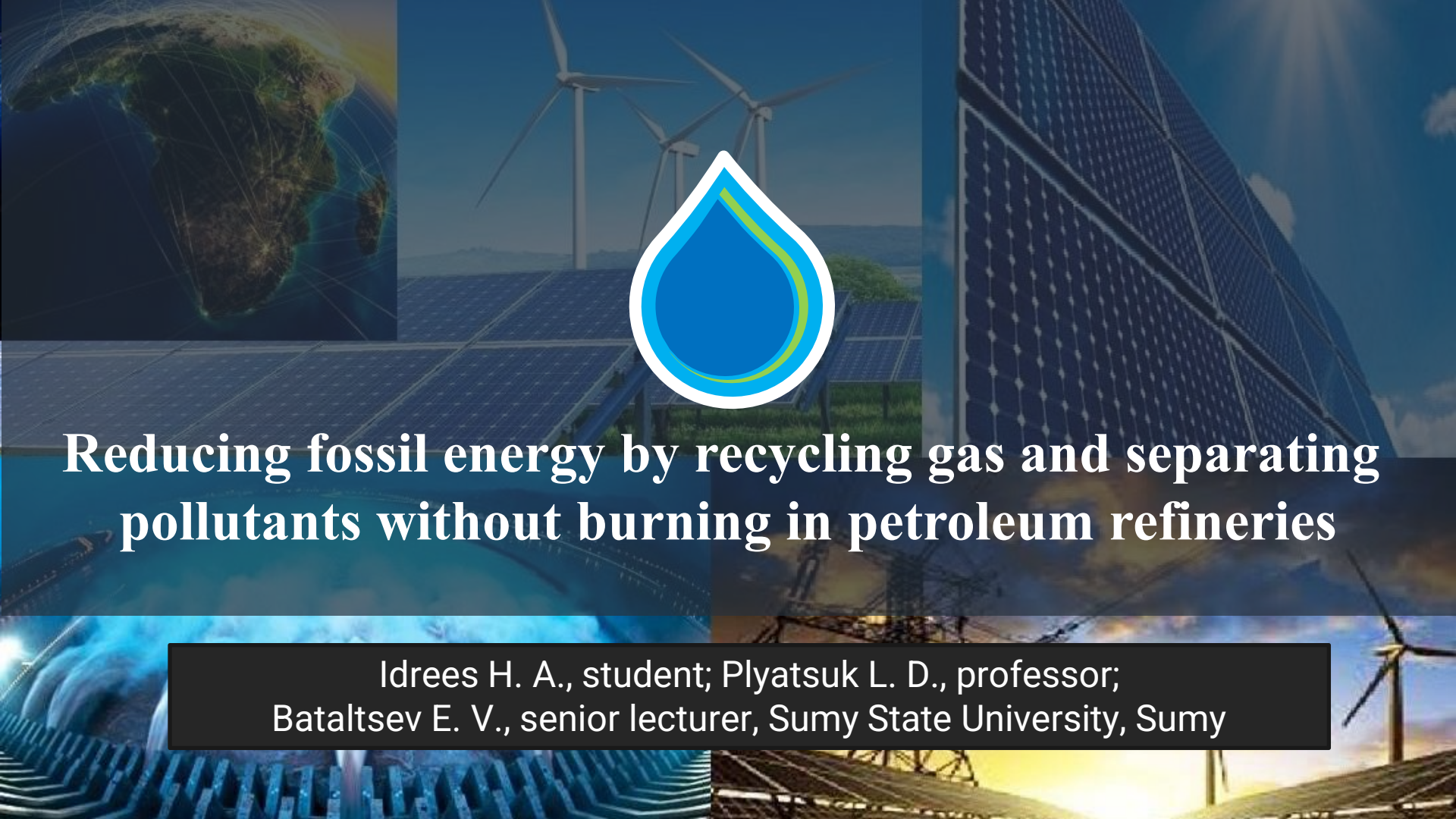

# Reducing fossil energy by recycling gas and separating pollutants without burning in petroleum refineries

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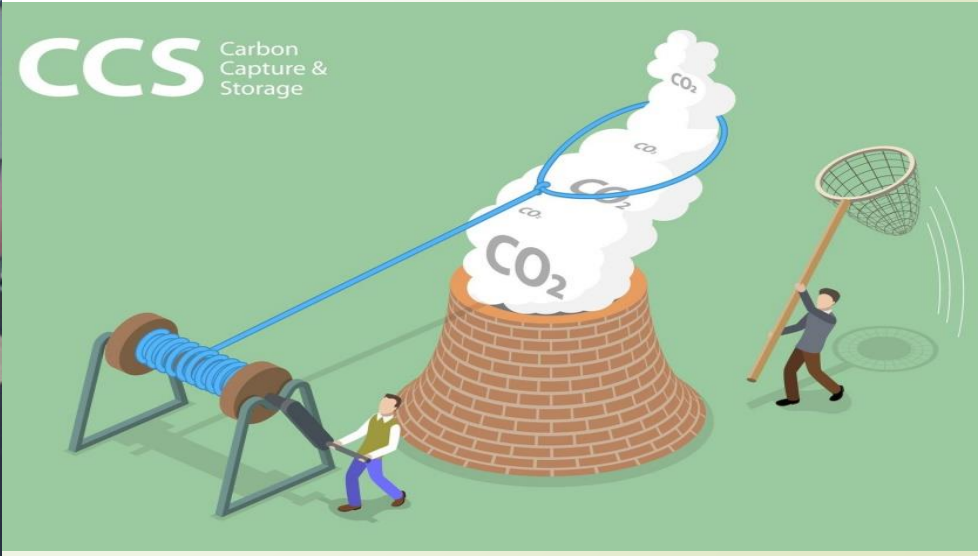
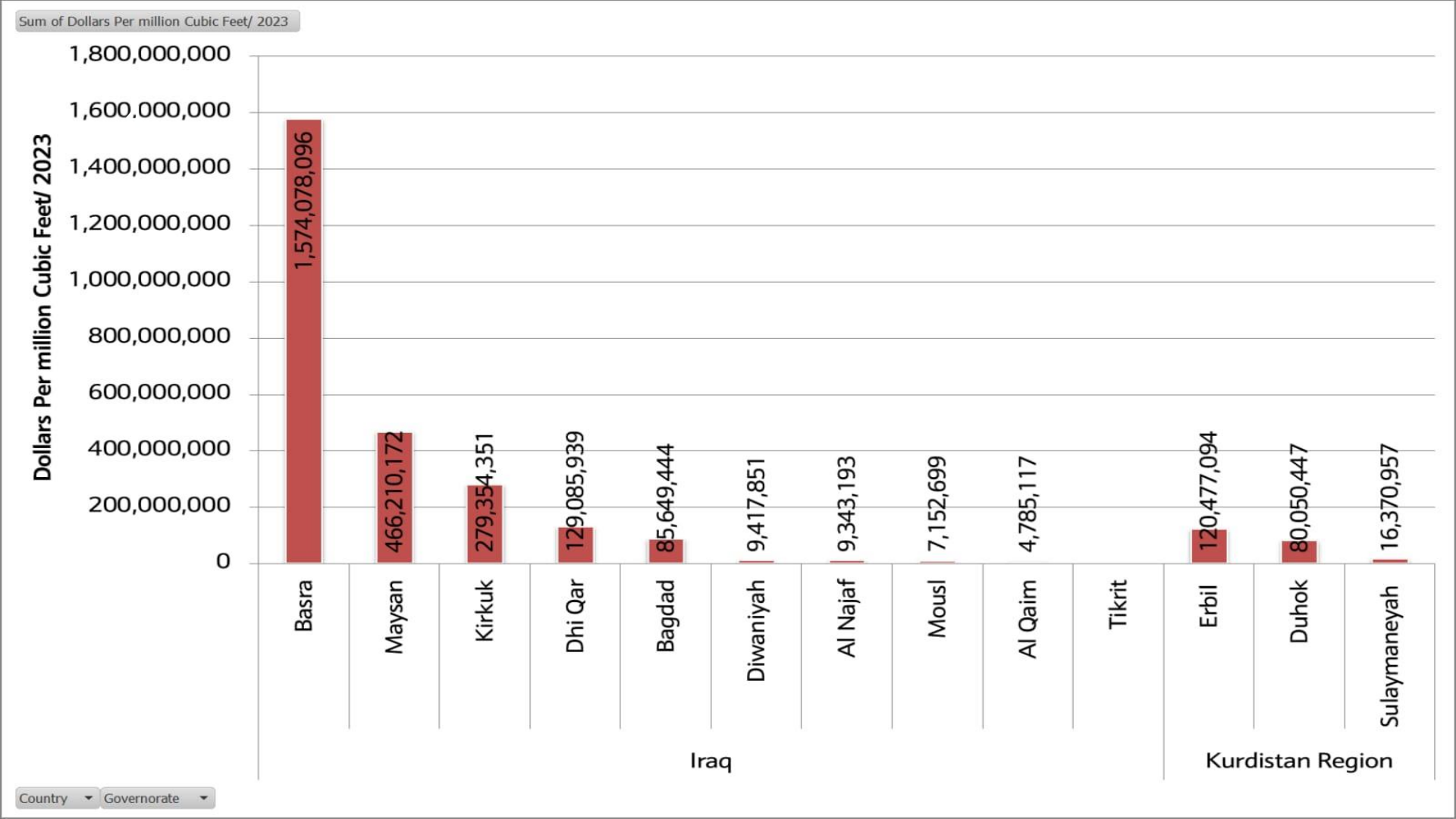
# Abstract

In this experimental study, the most important topics were highlighted, namely that in all oil refineries and oil and gas producing fields, large quantities of gas are burned for purposes including getting rid of sulfur compounds and hydrogen sulfide gas. The amount of gas burned annually is 17 billion cubic meters.. That is equivalent to $10 billion annually, The process of reducing gas and reusing it has an economic return, as well as preserving the environment and reducing emissions.

All the metals except gold and platinum combine with sulfur to form inorganic sulfides. Such sulfides are ionic compounds containing the negatively charged sulfide ion $S2-$; these compounds may be considered as salts of hydrogen sulfide

The sulfur removal rate in this prototype system unit, according to laboratory experiments, is estimated at 98%



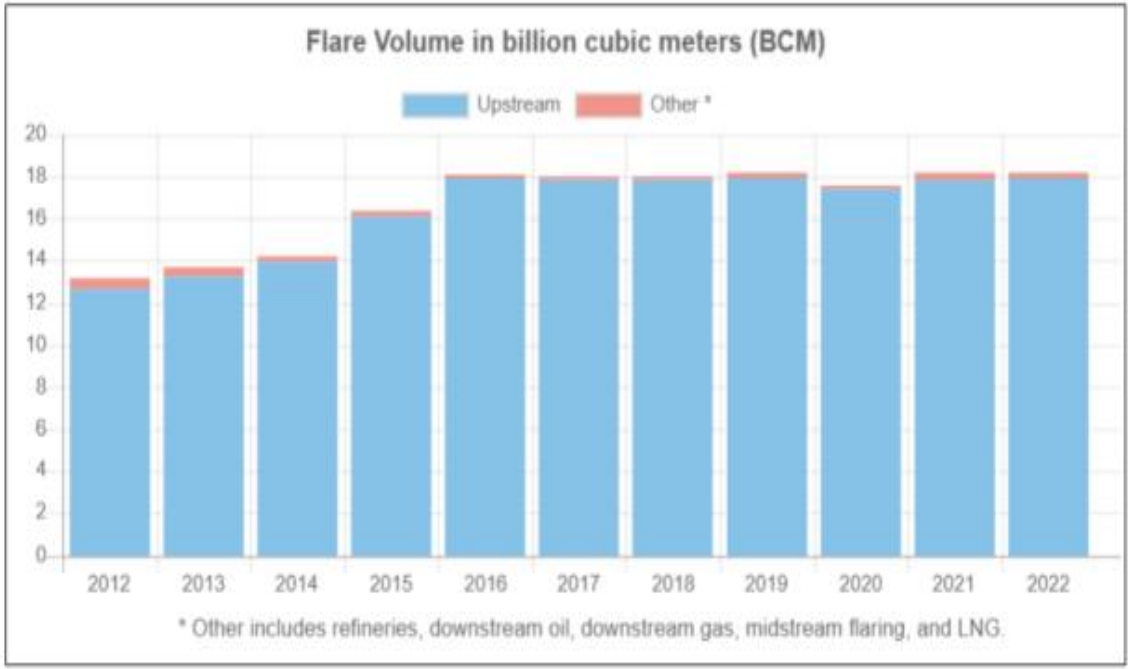

Sum of Dollars Per million Cubic Feet/ 2023
Dollars Per million Cubic Feet/ 2023
1,800,000,000
1,600,000,000
1,400,000,000
1,200,000,000
1,000,000,000
800,000,000
600,000,000
400,000,000
200,000,000
0
1,574,078,096
466,210,172
279,354,351
129,085,939
85,649,444
9,417,851
9,343,193
7,152,699
4,785,117
120,477,094
80,050,447
16,370,957
Basra
Maysan
Kirkuk
Dhi Qar
Bagdad
Diwaniyah
Al Najaf
Mousl
Al Qaim
Tikrit
Erbil
Duhok
Sulaymaneyah
Iraq
Kurdistan Region
Country
Governorate

**Country:** Iraq

**Number of Flaring Records:** 1415 (the same flaring source may have several records)

| Flare Type | Num Sites | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upstream | 1364 | 12.641430 | 13.267921 | 13.983211 | 16.148394 | 17.888408 | 17.843043 | 17.821249 | 17.919503 | 17.373786 | 17.800343 | 17.901724 | 180.589012 |
| Other | 51 | 0.572550 | 0.424382 | 0.256040 | 0.180885 | 0.184678 | 0.130190 | 0.185050 | 0.254026 | 0.227302 | 0.362495 | 0.310028 | 3.087627 |
| **Total** | 1415 | **13.213980** | **13.692303** | **14.239251** | **16.329279** | **18.073086** | **17.973233** | **18.006299** | **18.173529** | **17.601088** | **18.162839** | **18.211752** | **183.676640** |

Download



Sum of Million Cubic Meter /2023

Million Cubic Meter /2023

12,000
10,000
8,000
6,000
4,000
2,000
0

| Basra | Maysan | Kirkuk | Dhi Qar | Baqdad | Diwaniyah | Al Najaf | Mousl | Tikrit | Al Qaim | Erbil | Duhok | Sulaymaneyah |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9,986 | 2,958 | 2,062 | 819 | 561 | 60 | 59 | 48 | 40 | 30 | 789 | 508 | 104 |

Iraq

Kurdistan Region

Country

Governorate

The system included three towers for stripping, reducing, and adsorbing sulfur from gases using the same catalyst. Depending on the chemical properties of sulfur reactions with metals and the percentage of sulfur in the gas as the chemical reaction sulfur and metals formula

$$Fe + S \rightarrow FeS.$$

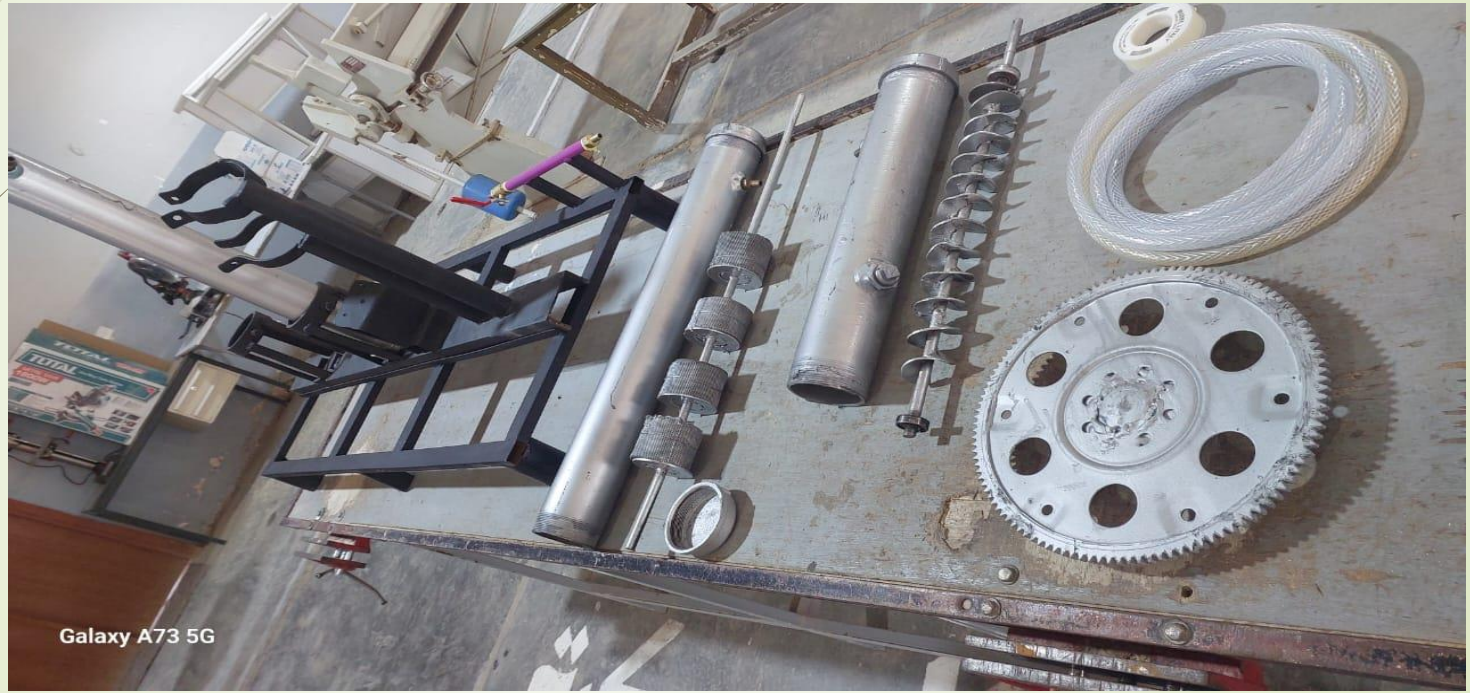
$$RS + Fe \rightarrow FeS + R \quad (R = \text{Mercaptan})$$

Figure. The flares in the refinery

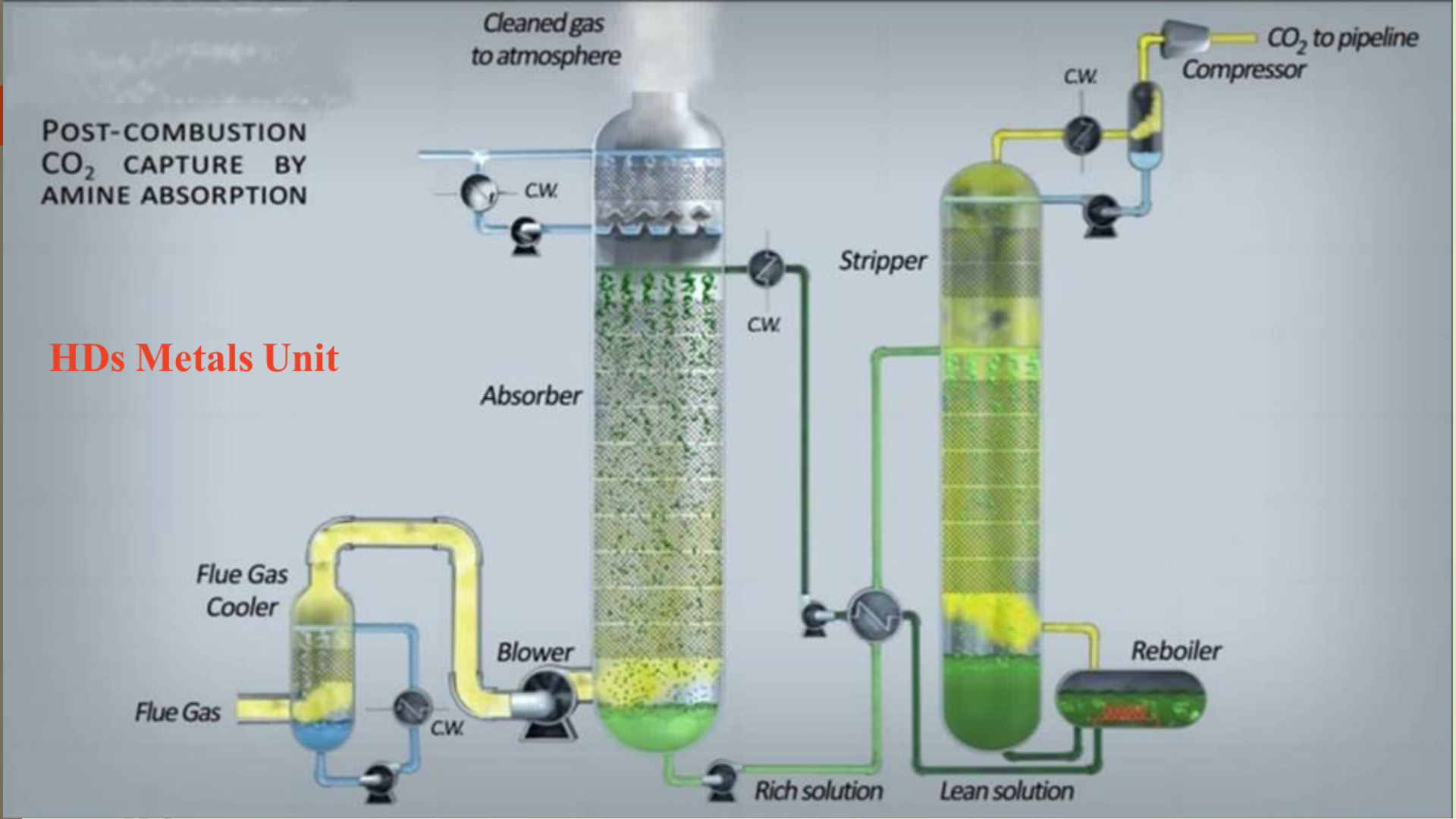
Figure of prototype system Unit sulfur reducing

# Unit Design

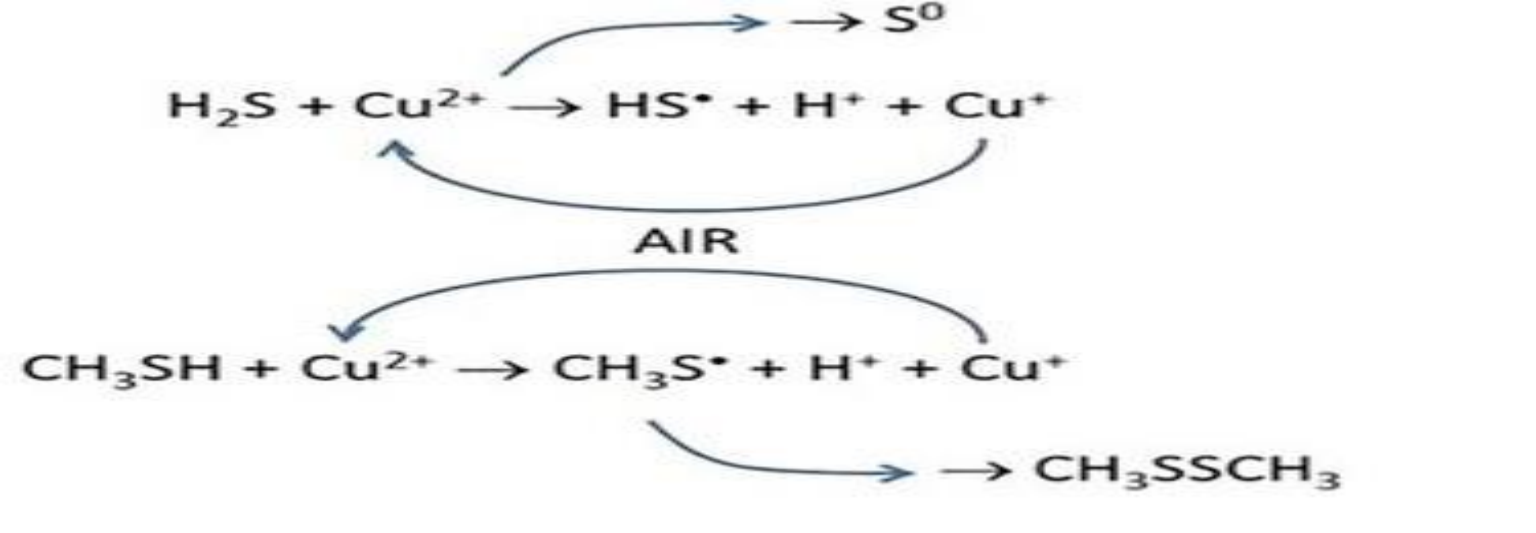
**Rotary adsorption tower Paked adsorption tower Reduction tower**



# Parts and fillings of towers


POST-COMBUSTION
$CO_2$ CAPTURE BY
AMINE ABSORPTION
HDs Metals Unit
Cleaned gas
to atmosphere
C.W.
Absorber
C.W.
Stripper
C.W.
$CO_2$ to pipeline
Compressor
Flue Gas
Cooler
Blower
Flue Gas
C.W.
Reboiler
Rich solution
Lean solution

# Chemical reaction



# Thanks For Listening