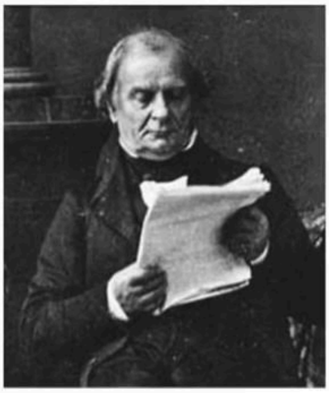
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

RESCIF
Réseau d'excellence des sciences de l'ingénieur de la Francophonie

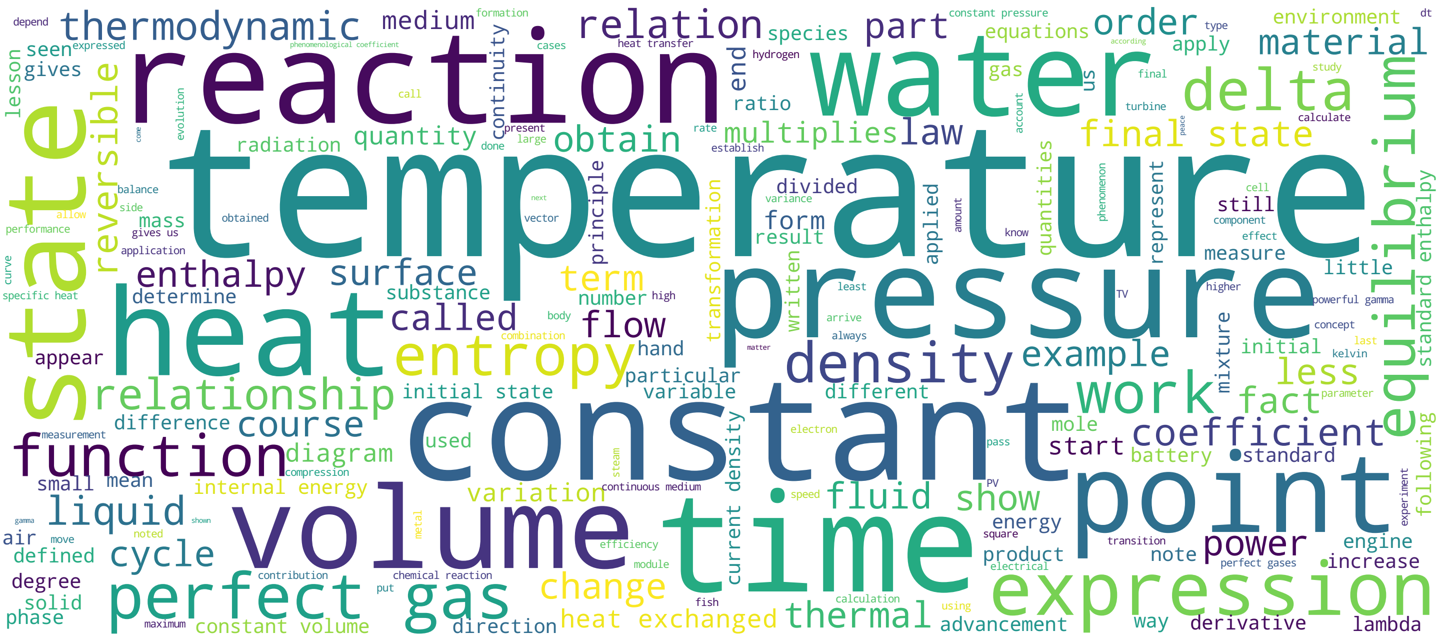


Emile Clapeyron, 1799-1864

Thermodynamique

Coefficients calorimétriques : Applications

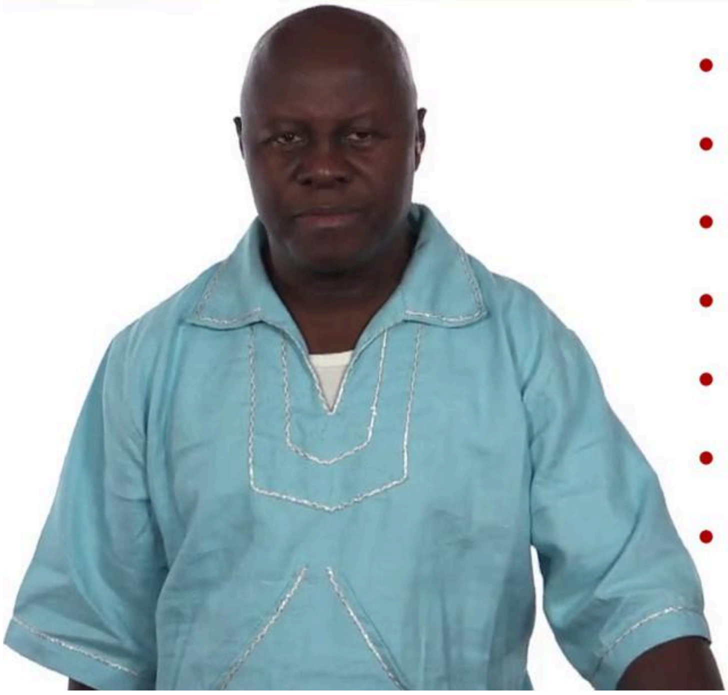
Ing. Dr. Paul-Salomon NGOHE-EKAM



Video

EPFL

Les coefficients calorimétriques–part 3-Applications



- Quantités infinitésimales de chaleur échangée
- Coefficients calorimétriques de chaleur sensible
- Coefficients calorimétriques de chaleur latente
- Relations entre Coefficients calorimétriques
- Obtention des Coefficients calorimétriques
- Cas des gaz parfaits
- Application: calcul de Q et W

Thermodynamique

Hello. It is still a real pleasure for me to contribute. To the words reefs of thermodynamics. Coordinated by the Federal Institute of Technology in Lausanne, Switzerland. I relieved Dr. Paul Salomon as a teacher at the Ecole nationale supérieure for the techniques of Yaoundé in Cameroon. It's fun this time, to talk to you about The Multiple Applications. It is in fact to apply all that we have seen, which leaves the mythical couple. Their definition, the determination, the relationships that bind them. And apply this to the determination of the quantity of heat exchanged and labor exchanged between the system and the grain. In the particular case of perfect gases.

Notes

Summary

0m 05s

Application : Exemple de calcul d'échanges de W et Q

Preuve

$\delta Q = C_v\, dT + l\, dV$

- Transformation isotherme réversible d'un gaz parfait

(1) Travail échangé :

$$W = -nRTln\left(\frac{V_f}{V_i}\right)$$

(2) Chaleur échangée :

$$Q = nRTln\left(\frac{V_f}{V_i}\right)$$

Thermodynamique

So. We begin. By examining the case of an isolated but reversible perturbation of a perfect gas. We will show that the work has changed and therefore given not w. D. The man had to be monitored. Indeed, the gas characterized by its equation of state is V. It was. We have defined the elementary work as cdrw equal to mp dv. This basic equation allowing us to get close to it has been raised. So we have W and N and LT. dV silver with information is a term was equal to constant in w to go from the initial state to the final state. W is integrated in the state from to the final state. Less and less. dV survey achieved its TNT synthesis is a constant in the quantity NTR constant and the integral N was of the chief corporal of measures V. That is, rt dv gives the order of v and in the state f n and a t that multiplies. WF. Lock. The man from the Netherlands had beautiful skin as soon as we have at least one helper. So DVF, follow. Here are your to pass from. And this decision will. We ride the same two. That the heat exchanged during the installation of a perfect gas is given by Q in ld during VF on V. Indeed. The infinitesimal heat exchanged was the same. Not the fish. A CVD. She who was the fish.

Notes

Summary

1m 01s

Application : Exemple de calcul d'échanges de W et Q

Preuve

$$\delta Q = C_v\, dT + \ell\, dV$$
$$= \ell\, dV$$
$$= P\, dV \quad \text{or} \quad PV = nRT$$
$$= \frac{nRT}{V}\, dV$$
$$= nRT \frac{dV}{V}$$
$$Q_{i \to f} = nRT \int_i^f \frac{dV}{V}$$
$$\boxed{Q_{i \to f} = nRT \ln \frac{V_f}{V_i}}$$

- Transformation isotherme réversible d'un gaz parfait

(1) Travail échangé :

$$W = -nRTln\left(\frac{V_f}{V_i}\right)$$

(2) Chaleur échangée :

$$Q = nRTln\left(\frac{V_f}{V_i}\right)$$

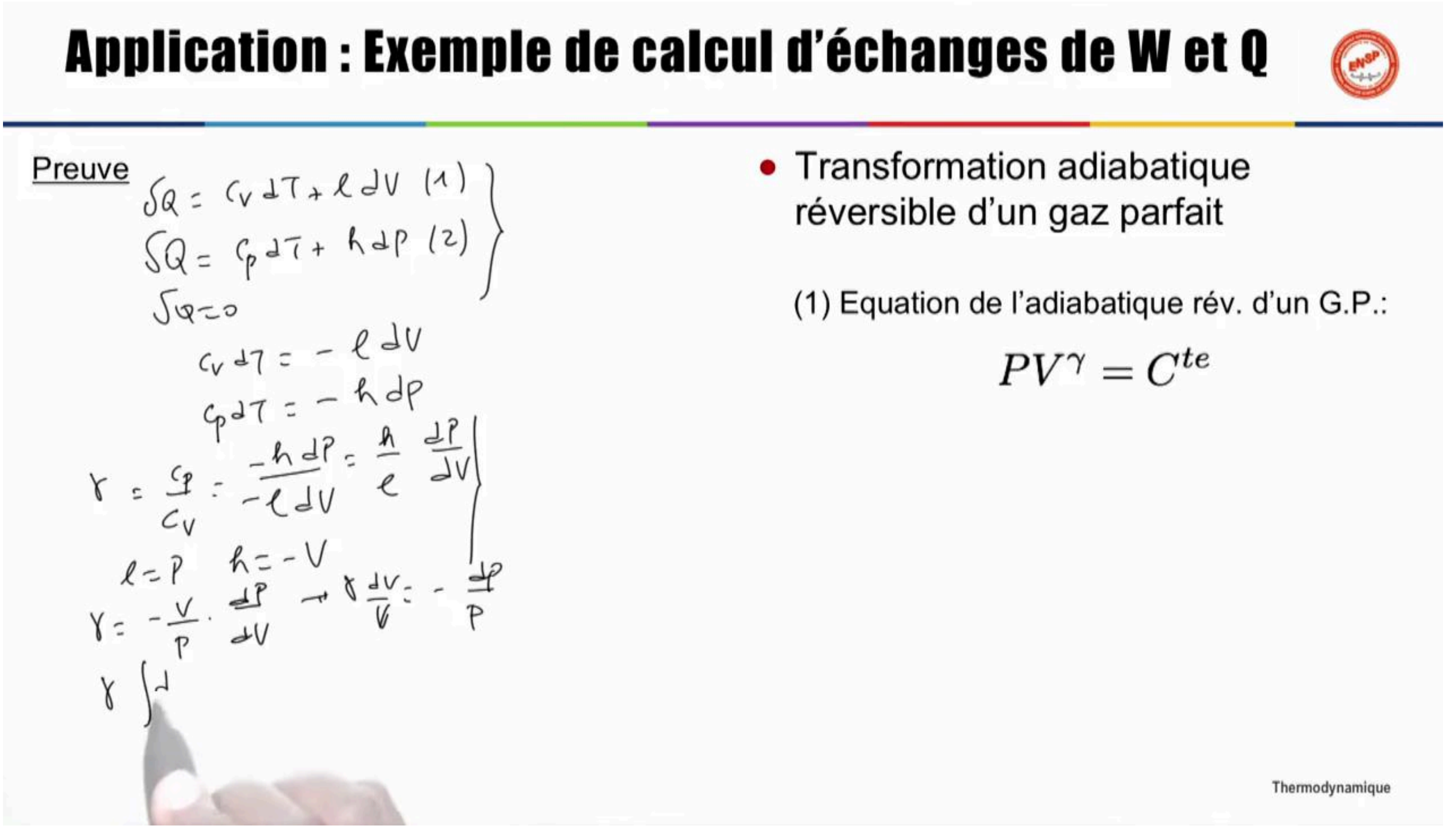
Thermodynamique

A good iso TM transmission of zero SDRs. We have a decoder at the dv. Now for the perfect gas, we have shown that l is equal to p. We have p. dV. At this level. Gas rentals. Perfect. Equal PV has been led to hate. LT Silver pdv. We have been DNV Silver Level integration in the Olympus to get from the initial to the final state. It was integral. PVs followed to validate the initial to final state. So outside of six months, we still have. NS usa nt. VF Log. Heat monitoring. And change the stairs to go from state is to F in the case of an isolated consumption so reversible.

Notes

Summary

3m 23s

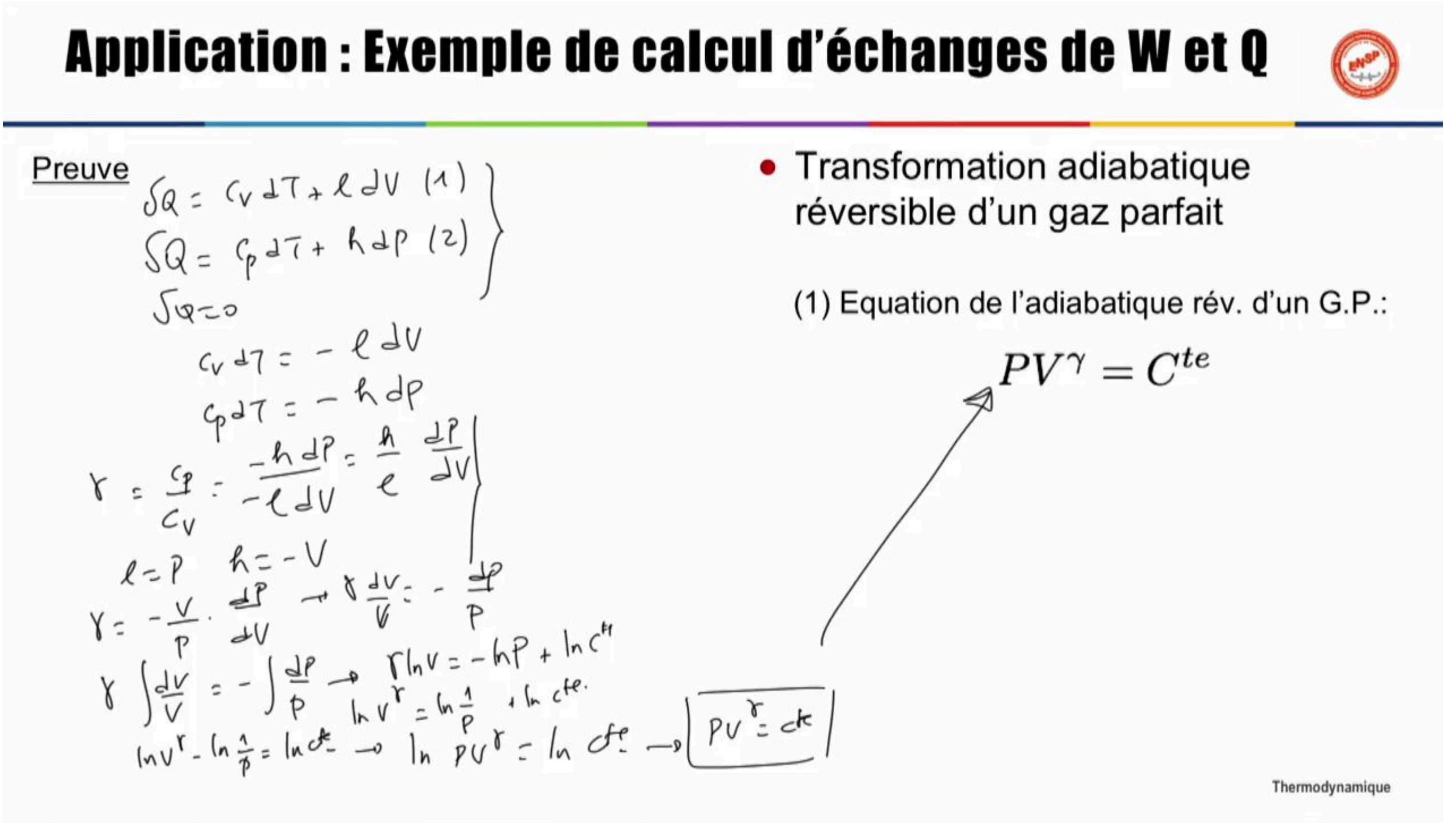


The second case of transformation that we We will consider a reversible adiabatic transformation of a perfect gas. We will start by establishing the equation of the debt to build or try of a perfect gas, namely ten times V. Powerful gamma and VAT. The constant. Indeed the equations giving the infinitesimal quantities of heat exchanged. Sound of the form. Decu of the CFDT. LD but it was equation one and equation two of the CP. Summer. The use of equations. A threat we consider to be in the case of the adiabatic summation is equal to zero. The combination of this law allows to have in the SME the equation of which cv dt and tva is the L1 of the V in the second equation. CP dt. Also H. DP. It is the desire to make a contribution of these last two equations of which we have C.P. Su. CSV of p. If the LGW. Has it dissipated? The one on the other side cp. Su? Resume. We got it right kid. Good. Considering the fact that it was there the peace. And the wrong one. But in the church. Damascus to h v su help that multiplies. BP owed him. And his death. The CPL is valid. So we have. Gamma dv survey. Equal to less. Juppé. Equation that we integrate in. An integral effect. of Obama integral.

Notes

Summary

4m 34s

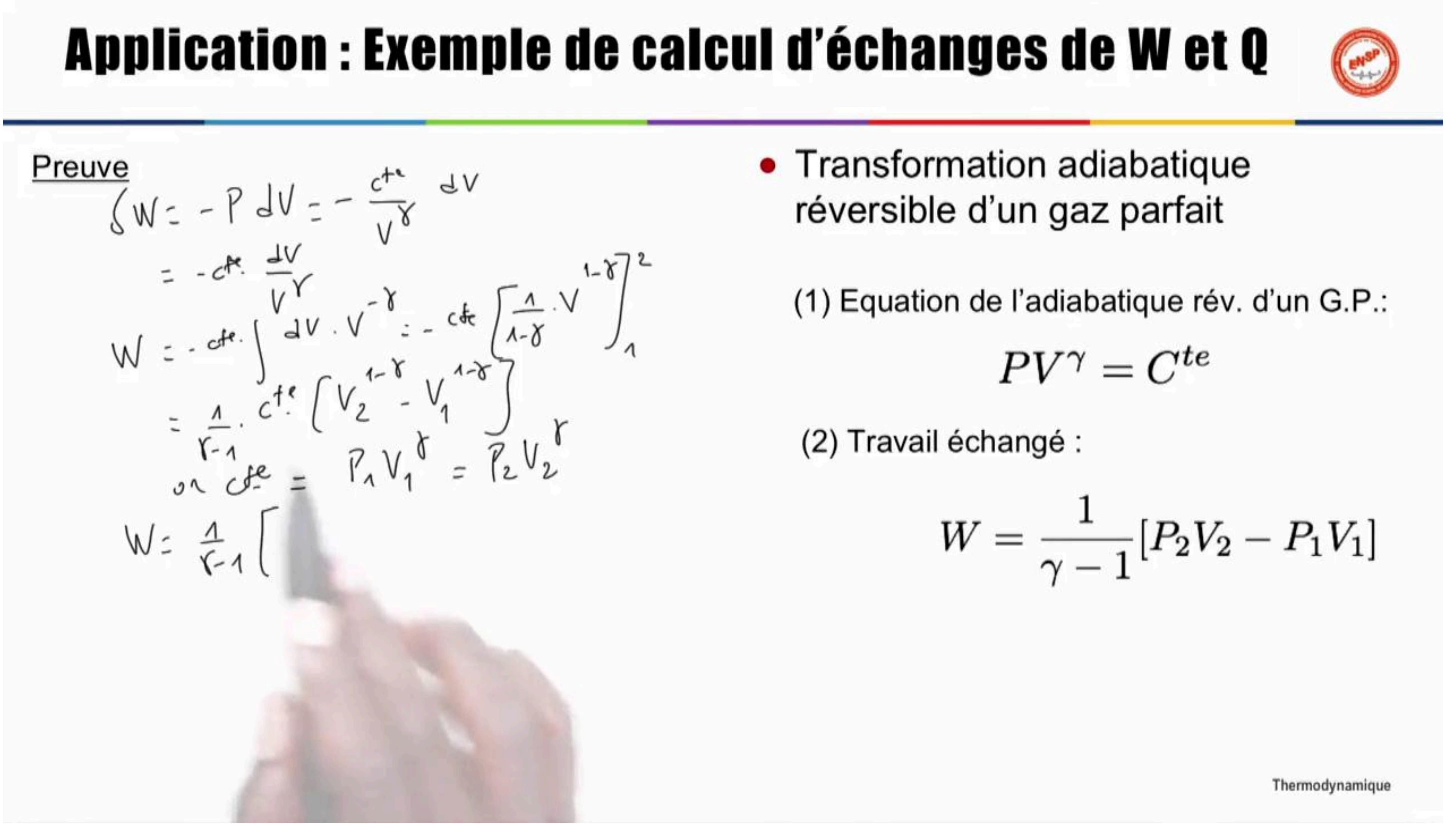


DDV was also following Juppé's DPs. Taking into account of course the constants. When we make an integral generalized as this one, we will gamma when the is equal to minus. During the PAI, that is to say during the exhausting dama. Equal to. At a dinner party. Of course, the was the temperature during a constant. During a constant. By seeing, then. P. On the other side, according to the order of common sense. At a dinner party, at a constant. And the language of P. Before the order of the order of that year, of peace with Damascus, equal to the order of a constant that we draw in the PV of Goma. There is one constant. This is the equation of the drama. Of a perfect gas. Let's go now having been able to establish the adiabatic equation. A perfect gas. Determine loads, declare heat fields in the case of adiabatic transmission of a perfect gas.

Notes

Summary

6m 58s

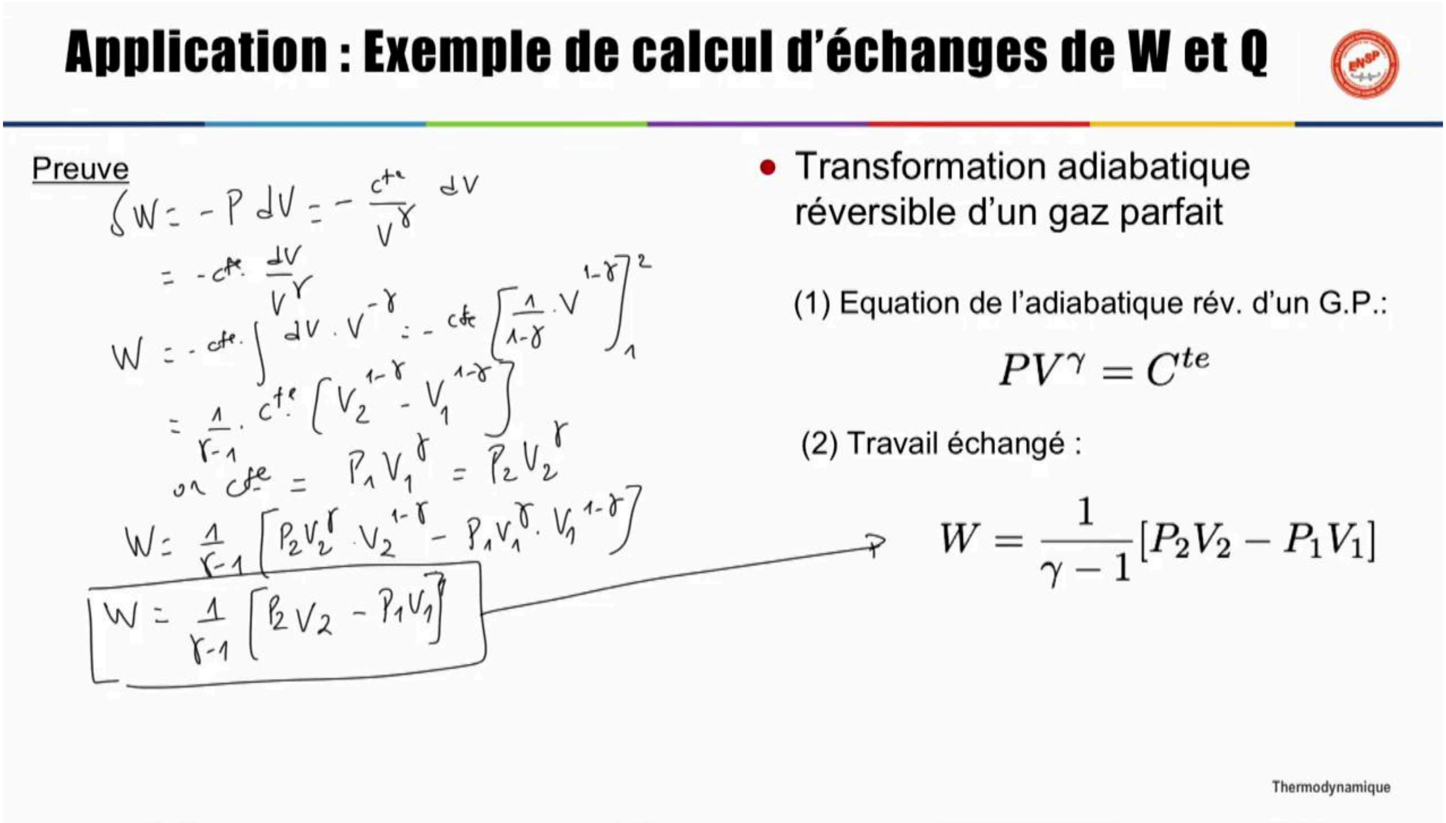


First, the amount of work exchanged during the Sabatier displacement of a perfect gas. We will show that it is equal to them on a raised foot of at -1 V1 or the final state at the index of the initial state. Index. Indeed. Definition of w. P dv. We had the p-fish at the constant. So we have constants. Overpowering Gamma, just like the WW of the Dutch W. Equal constant. In the month of Constantine dV followed. Do. If we are to integrate in a path from inmates to the final state, we have w. Equal to at least constant integral DDV power of the hand in the constant world. What multiplies on my gamma that multiplies the gamma powers to be taken between the initials one and final two C thus gives. An evolution of the fauna. It is a manga, but at least here we will have one on one that multiplies a constant that will multiply V of power. A good gamma. We want a power, a gamma. But as much as this one. It was already there and had a powerful gamma, gave up the support of my two powerful gammas, since the adiabatic equation and verified was a whole state of equilibrium, in particular in the initial state equilibrium stage two in the equation plane of W here. With a.

Notes

Summary

8m 22s



And then the constant Calamity Blonde, paved on the same level as here, foot raised for five years. Hide constant of however seen since tomorrow the consonant multiplied by the PNV, a powerful gamma and just like multiplies v1 power. A good kid, for sure that multiplies. Then two tries before power. Kid, you have the chips. A world of more and more, a world of envy, power, a WIMP and a V1 also power. One. Do w. In the case of a reversible adiabatic transformation of a perfect gas. Is equal to a packet of V1 POS. When the transmission takes place from the state to the state of.

Notes

Summary

10m 31s

Application : Exemple de calcul d'échanges de W et Q

Preuve

$\delta Q = 0 \rightarrow Q = \int \delta Q = 0$

- Transformation adiabatique réversible d'un gaz parfait

(1) Equation de l'adiabatique rév. d'un G.P.:

$$PV^{\gamma} = C^{te}$$

(2) Travail échangé :

$$W = \frac{1}{\gamma - 1}[P_2V_2 - P_1V_1]$$

(3) Chaleur échangée :

$$Q = 0$$

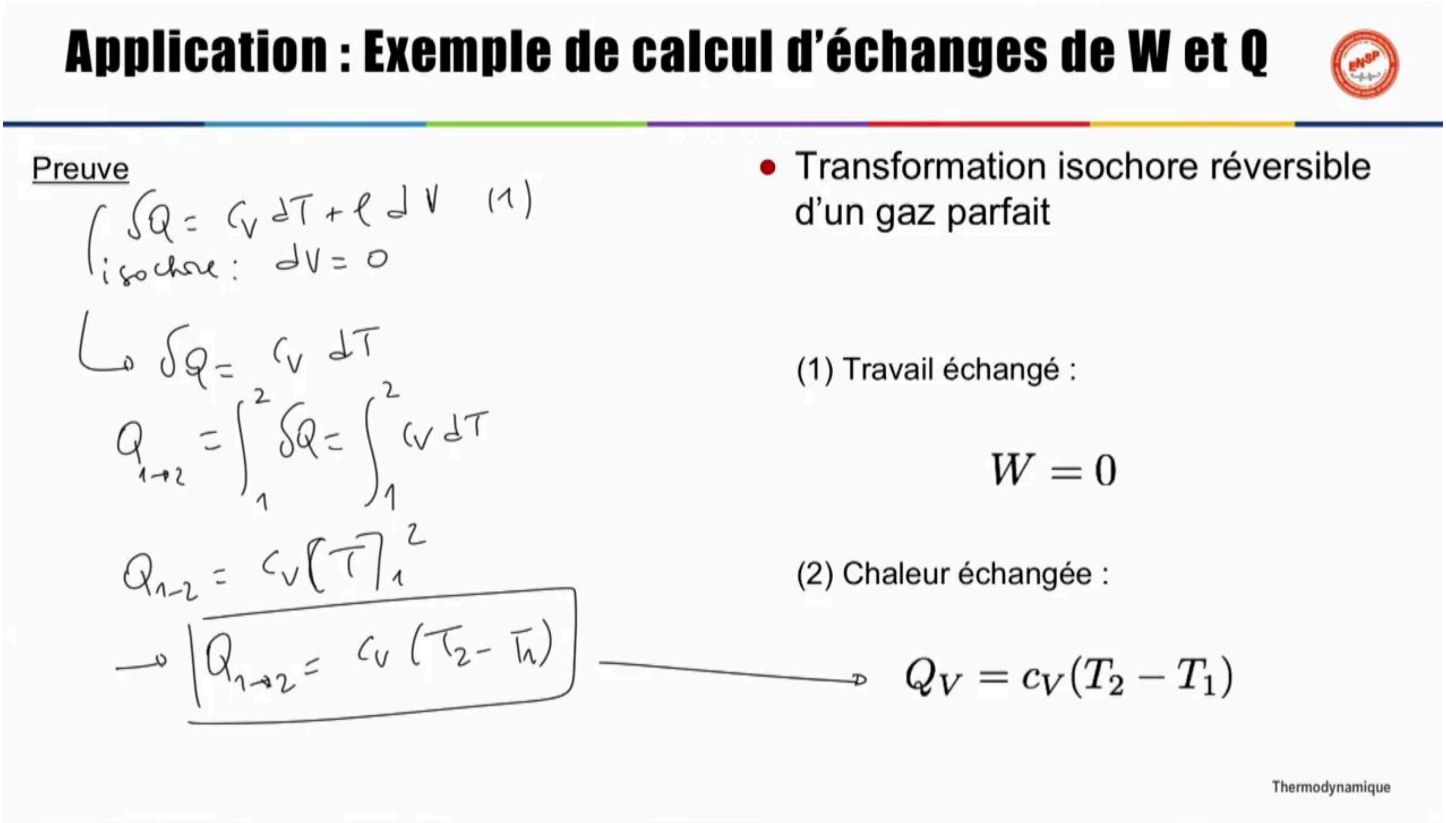
Thermodynamique

For an alternative restoration to that of a perfect gas of which we have the wisdom indicated null to the alternative. You don't even have to go and dismantle the other one. The adiabatic transmutation. DQ is zero and the sum of the DQs is zero. In the front a zero heat exchange. We will now consider a third transformation.

Notes

Summary

11m 31s

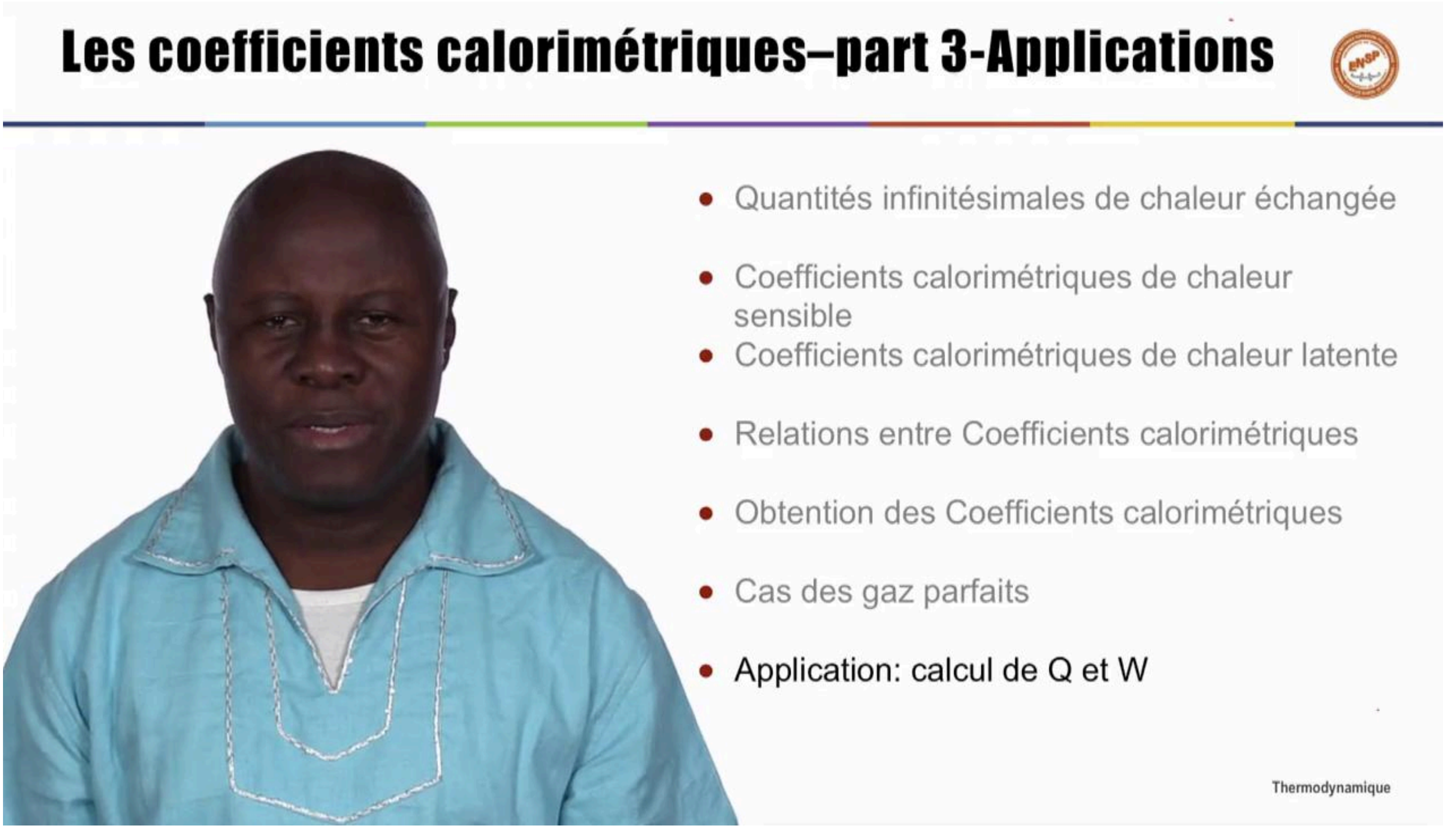


Always the targets of a perfect gas, namely the ISO core target. Right. ISO as in. But we say that the volume is constant. One DVD at a time. And like working on keeping up with the DVDs on TV. Null in W which is the integral. Upstairs, he left an account in the rungs. So for that it did the work and, without boredom, went up a little. For the transformation, it targets heat and is given by PV equal ACV. Will it be disassembled or was T taken down and underwear? It is a little bit the TV. the initial state, the final state. Indeed, the quantity of elementary heat DQ is given to us by the equation of any value cvd t it becomes one. We have an iso glue transformation, which means that the combination of these two equations allows to indicate that was the LCA dt. And the heat exchanged can go from a initial state to a final state from the time integral to the final state of the inmates of the entirety of the rooms to the final floor of the CMDT of we obtain. The heat, change the LCA that multiplies and takes of the Internet helped, that is to say more can go to the TV that is less. And who is there.

Notes

Summary

11m 57s



Well at the end of this lesson. Thank you for your attention. We can't do it without worrying. I dare to believe that the few applications. What we did during this lesson, namely. The calculation of some quantity of heat exchanged during particular transformations. The commitment to do. I've been there too. The calculations the quantities of work exchanged between the system, the cells. It is a particular case of reversible transformation of perfect gases. Have allowed you to better understand. A lesson in warmth and above all the usefulness of multiple calorie coefficients. I hope that we will continue to receive present and attentive in the following lessons of Eco Reef Thermodynamics coordinated by the PSL, Ecole Polytechnique Fédérale de Lausanne. Thank you.

Notes

Summary

13m 50s