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Ready-to-use ESL/EFL Lessons by Sean Banville

New machine sucks CO2 from the air

http://www.breakingnewsenglish.com/0911/091130-co2.html

Contents

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THE ARTICLE

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

Engineers at a U.S. laboratory may have discovered one answer to the problem of global warming. They have made a machine that can suck carbon dioxide from the air and convert it into liquid fuel. Researchers at the Sandia National Labs believe their creation can provide a sustainable form of renewable energy. Their device sounds like something from science fiction. In fact, the name of it is probably the most difficult thing to understand. It is the Counter-Rotating-Ring Receiver Reactor Recuperator, or CR5 for short. Lead developer Rich Diver is excited about his project. He said sucking CO2 from the environment could be an alternative to carbon sequestration. This is a method of burying CO2 deep underground.

Sandia calls the process carried out by CR5 "Sunshine to Petrol". The researchers say their invention is still 15 to 20 years away from being in full operation. It is currently just a prototype – a small model of the real thing. A Sandia spokeswoman said it "holds a real promise of being able to reduce carbon dioxide emissions". She added it would allow us "to keep using fuels we know and love". It is possible that by 2030, cars and airplanes will run on the converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to see if this machine can actually lower our carbon footprint. Yes, it reduces carbon dioxide in the atmosphere, but its liquid fuel product causes pollution when it burns.

WARM-UPS

1. CO2: Walk around the class and talk to other students about CO2 emissions. Change partners often. Sit with your first partner(s) and share your findings.

2. CHAT: In pairs / groups, decide which of these topics or words from the article are most interesting and which are most boring.

> *engineers / answers / labs / fuel / renewable energy / science fiction / alternatives / sunshine / inventions / gasoline / carbon footprint / the atmosphere / pollution*

Have a chat about the topics you liked. Change topics and partners frequently.

3. INVENTIONS: What inventions do we need? Complete this table with your partner(s). Change partners and share your ideas. Take a class vote on the best ones.

Invention	5-letter acronym	What it does
Studying		
Home		
Transport		
Computer		
Food		
Money		

4. CARBON EMISSIONS: Students A **strongly** believe carbon emissions will not be a problem in the future; Students B **strongly** believe the opposite. Change partners again and talk about your conversations.

5. WHAT CAN I DO?: What can you do to reduce your carbon footprint? Talk about these things with your partner(s). Change partners and share what you heard.

- what I can do right now
- what I can do at home
- what I can do with my family
- what I can do about transport
- what I can do to tell others
- what I can do about my government
- what I can do in stores
- what I can do every day

6. SCIENCE FICTION: Spend one minute writing down all of the different words you associate with the term 'science fiction'. Share your words with your partner(s) and talk about them. Together, put the words into different categories.

BEFORE READING / LISTENING

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

1. TRUE / FALSE: Read the headline. Guess if a-h below are true (T) or false (F).

a. Engineers have found the solution to global warming. T / F
b. A new machine can extract CO2 from the air and make it disappear. T / F
c. The name of the machine is very easy to remember. T / F
d. Using the machine may be better than storing CO2 underground. T / F
e. The technology is still up to two decades away from everyday use. T / F
f. Only a smaller version of the machine is in use today. T / F
g. Fuel produced by the machine will replace petrol. T / F
h. Fuel produced by the machine will create further pollution T / F

2. SYNONYM MATCH: Match the following synonyms from the article.

1.	discovered	a.	give
2	convert	b.	comprehend
3.	provide	c.	complete
4.	understand	d.	operate
5.	alternative	e.	reduce
6.	process	f.	change
7.	full	g.	technique
8.	run	h.	substitute
9.	lower	i.	creates
10.	causes	j.	found

3. PHRASE MATCH: (Sometimes more than one choice is possible.)

1.	one answer to the	a.	renewable energy
2	suck carbon dioxide	b.	of the real thing
3.	a sustainable form of	c.	the atmosphere
4.	sounds like something from	d.	to carbon sequestration
5.	an alternative	e.	from the air
6.	15 to 20 years away from	f.	carbon footprint
7.	just a prototype – a small model	g.	problem of global warming
8.	reduce carbon dioxide	h.	being in full operation
9.	lower our	i.	emissions
10.	reduces carbon dioxide in	j.	science fiction

WHILE READING / LISTENING

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

GAP FILL: Put the words into the gaps in the text.

Engineers at a U.S. laboratory _____ have discovered one answer to the problem of global warming. They have made a machine that can suck carbon dioxide from the air and _____ it into liquid fuel. Researchers at the Sandia National Labs _____ their creation can provide a sustainable form of renewable energy. Their device sounds like something from science _____. In fact, the _____ of it is probably the most difficult thing to understand. It is the Counter-Rotating-Ring Receiver Reactor Recuperator, or CR5 for _____. Lead developer Rich Diver is excited about his _____. He said sucking CO2 from the environment could be an alternative to carbon sequestration. This is a _____ of burying CO2 deep underground.

short
convert
fiction
name
may
method
believe
project

Sandia calls the process _____ out by CR5 "Sunshine to Petrol". The researchers say their _____ is still 15 to 20 years away from being in full operation. It is _____ just a prototype – a small model of the real _____. A Sandia spokeswoman said it "holds a real promise of being able to reduce carbon dioxide emissions". She added it would _____ us "to keep using fuels we know and love". It is possible that by 2030, cars and airplanes will _____ on the converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to _____ if this machine can actually lower our carbon footprint. Yes, it reduces carbon dioxide in the atmosphere, but its liquid fuel product _____ pollution when it burns.

allow
see
invention
thing
carried
causes
run
currently

LISTENING – Listen and fill in the gaps

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

Engineers at a U.S. laboratory may have discovered _____ problem of global warming. They have made a machine that can suck carbon dioxide from the air _____ liquid fuel. Researchers at the Sandia National Labs believe their creation can provide a sustainable form of renewable energy. _____ something from science fiction. In fact, the name _____ the most difficult thing to understand. It is the Counter-Rotating-Ring Receiver Reactor Recuperator, _____. Lead developer Rich Diver is excited about his project. He said sucking CO2 from the environment could be an alternative to carbon sequestration. This _____ CO2 deep underground.

Sandia calls the _____ by CR5 "Sunshine to Petrol". The researchers say their invention is still 15 to 20 years away from _____. It is currently just a prototype – a small model of the real thing. A Sandia spokeswoman said it "_____ of being able to reduce carbon dioxide emissions". She added it would allow us "to keep using fuels _____". It is possible that by 2030, cars and airplanes _____ converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to see if this machine can actually lower our carbon footprint. Yes, it reduces carbon dioxide in the atmosphere, but _____ causes pollution when it burns.

AFTER READING / LISTENING

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

1. WORD SEARCH: Look in your dictionary / computer to find collocates, other meanings, information, synonyms … for the words 'liquid' and 'fuel'.

liquid	**fuel**

- Share your findings with your partners.
- Make questions using the words you found.
- Ask your partner / group your questions.

2. ARTICLE QUESTIONS: Look back at the article and write down some questions you would like to ask the class about the text.

- Share your questions with other classmates / groups.
- Ask your partner / group your questions.

3. GAP FILL: In pairs / groups, compare your answers to this exercise. Check your answers. Talk about the words from the activity. Were they new, interesting, worth learning…?

4. VOCABULARY: Circle any words you do not understand. In groups, pool unknown words and use dictionaries to find their meanings.

5. TEST EACH OTHER: Look at the words below. With your partner, try to recall how they were used in the text:

• answer • convert • provide • name • project • method	• carried • still • promise • love • run • burns

STUDENT CO2 SURVEY

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

Write five GOOD questions about CO2 in the table. Do this in pairs. Each student must write the questions on his / her own paper.
When you have finished, interview other students. Write down their answers.

	STUDENT 1 _____	STUDENT 2 _____	STUDENT 3 _____
Q.1.			
Q.2.			
Q.3.			
Q.4.			
Q.5.			

- Now return to your original partner and share and talk about what you found out. Change partners often.
- Make mini-presentations to other groups on your findings.

CO2 DISCUSSION

STUDENT A's QUESTIONS (Do not show these to student B)

a) What did you think when you read the headline?

b) What springs to mind when you hear the term 'carbon dioxide'?

c) What do you think about this article?

d) Do you think the CR5 machine will save the planet?

e) Do you think anything will ever help the planet?

f) What is the answer to the problem of global warming?

g) Do you think science fiction always comes true?

h) What do you think of the name of the new machine? Do you know what the words mean?

i) What would it be like to work at a lab like Sanida's?

j) How worried are you about global warming?

CO2 DISCUSSION

STUDENT B's QUESTIONS (Do not show these to student A)

a) Did you like reading this article?

b) How does CO2 damage the Earth?

c) What do you think of the "Sunshine to Petrol" slogan?

d) Are you interested in following this story over the next 20 years?

e) This machine produces gasoline. Is this really an answer to our problems?

f) What do you think about your carbon footprint?

g) Do you think governments should invest money in CR5?

h) What is your government doing to help the environment?

i) If you were leader of the world, what would you do to cut carbon emissions?

j) What questions would you like to ask lead developer Rich Diver?

LANGUAGE – MULTIPLE CHOICE

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

Engineers at a U.S. laboratory may have discovered one answer to the problem (1) _____ global warming. They have made a machine that can suck carbon dioxide from the air and convert it (2) _____ liquid fuel. Researchers at the Sandia National Labs believe their creation can provide a sustainable (3) _____ of renewable energy. Their device sounds like something from (4) _____ fiction. In fact, the name of it is probably the most difficult thing to understand. It is the Counter-Rotating-Ring Receiver Reactor Recuperator, or CR5 for (5) _____. Lead developer Rich Diver is excited about his project. He said sucking CO2 from the environment could be an alternative to carbon sequestration. This is a method of burying CO2 (6) _____ underground.

Sandia calls the process carried (7) _____ by CR5 "Sunshine to Petrol". The researchers say their invention is still 15 to 20 years away from being in (8) _____ operation. It is currently just a prototype – a small model of the real thing. A Sandia spokeswoman said it "holds a real promise of being able to reduce carbon dioxide emissions". She added it would allow us "to keep (9) _____ fuels we know and love". It is possible that (10) _____ 2030, cars and airplanes will run on the converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to (11) _____ if this machine can actually lower our carbon (12) _____. Yes, it reduces carbon dioxide in the atmosphere, but its liquid fuel product causes pollution when it burns.

Put the correct words from the table below in the above article.

1.	(a)	of	(b)	by	(c)	at	(d) for
2.	(a)	onto	(b)	at	(c)	into	(d) by
3.	(a)	firm	(b)	farm	(c)	from	(d) form
4.	(a)	scientists	(b)	science	(c)	sciences	(d) scientific
5.	(a)	small	(b)	brief	(c)	abbreviated	(d) short
6.	(a)	depth	(b)	deeply	(c)	deep	(d) deepness
7.	(a)	under	(b)	out	(c)	away	(d) up
8.	(a)	full	(b)	filling	(c)	filler	(d) full up
9.	(a)	using	(b)	use	(c)	used	(d) useless
10.	(a)	on	(b)	at	(c)	by	(d) until
11.	(a)	view	(b)	look	(c)	watch	(d) see
12.	(a)	paw print	(b)	footprint	(c)	hoof print	(d) handprint

WRITING

From http://www.BreakingNewsEnglish.com/0911/091130-co2.html

Write about **CO2** for 10 minutes. Correct your partner's paper.

HOMEWORK

1. VOCABULARY EXTENSION: Choose several of the words from the text. Use a dictionary or Google's search field (or another search engine) to build up more associations / collocations of each word.

2. INTERNET: Search the Internet and find out more about CO2. Share what you discover with your partner(s) in the next lesson.

3. GLOBAL WARMING: Make a poster about global warming. What causes it? What are governments doing to tackle it? Show your work to your classmates in the next lesson. Did you all have similar things?

4. 2030: Write a magazine article about the environment in 2030. Include imaginary interviews with someone who lives in 2030 (but who has traveled back in time) and someone from today.

Read what you wrote to your classmates in the next lesson. Write down any new words and expressions you hear from your partner(s).

5. LETTER: Write a letter to your country's leader. Ask him/her three questions about your country's carbon emissions. Give him/her three ideas to reduce them. Read your letter to your partner(s) in your next lesson. Your partner(s) will answer your questions.

ANSWERS

TRUE / FALSE:

a. F b. F c. F d. T e. T f. T g. F h. T

SYNONYM MATCH:

1.	discovered	a.	found
2	convert	b.	change
3.	provide	c.	give
4.	understand	d.	comprehend
5.	alternative	e.	substitute
6.	process	f.	technique
7.	full	g.	complete
8.	run	h.	operate
9.	lower	i.	reduce
10.	causes	j.	creates

PHRASE MATCH:

1.	one answer to the	a.	problem of global warming
2	suck carbon dioxide	b.	from the air
3.	a sustainable form of	c.	renewable energy
4.	sounds like something from	d.	science fiction
5.	an alternative	e.	to carbon sequestration
6.	15 to 20 years away from	f.	being in full operation
7.	just a prototype – a small model	g.	of the real thing
8.	reduce carbon dioxide	h.	emissions
9.	lower our	i.	carbon footprint
10.	reduces carbon dioxide in	j.	the atmosphere

GAP FILL:

New machine sucks CO2 from the air

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Sandia calls the process **carried** out by CR5 "Sunshine to Petrol". The researchers say their **invention** is still 15 to 20 years away from being in full operation. It is **currently** just a prototype – a small model of the real **thing**. A Sandia spokeswoman said it "holds a real promise of being able to reduce carbon dioxide emissions". She added it would **allow** us "to keep using fuels we know and love". It is possible that by 2030, cars and airplanes will **run** on the converted fuel. It will produce fuels such as methanol and gasoline. It will be interesting to **see** if this machine can actually lower our carbon footprint. Yes, it reduces carbon dioxide in the atmosphere, but its liquid fuel product **causes** pollution when it burns.

LANGUAGE WORK

1 - a 2 - c 3 - d 4 - b 5 - d 6 - c 7 - b 8 - a 9 -a 10 - c 11 - d 12 - b