the source of so much

petroleum

INSIDE

petroleum
the source of so much

What you wear, what you eat, how you look, how you have fun, how you get from one place to another – all this and more is, believe it or not, tied closely to the extraction and processing of crude oil and natural gas. In fact, petroleum-based products are such a part of your life that you probably don't even think about them. But if they all disappeared tomorrow, you wouldn't know how to get through your day.

The proof is around the pudding

Open your fridge and look around. The plastic container that holds last night's leftover dessert is natural gas in a form you use every day. Ditto the self-sealing bag that holds your sandwich for school, the jug of orange juice, and the clingy film around the block of cheese. The bags these groceries were packed in, and the bags that you (in all likelihood) will eventually use to toss the green, fuzzy items from the back of the fridge into the garbage, also started their journey to your fridge from one of Canada's natural gas pools.

Walk into your bathroom, and the story is the same. Plastic garbage cans, shower curtains, shampoo, cosmetics, toothbrushes – all are made from petrochemicals.

Check the other rooms in your house, too. Have you ever thought about the origins of those CDs that you enjoy so much? The casing, circuitry and

Activities are done individually, with a partner or in a small group.

individual partner group

PETROLEUM
THE SOURCE OF SO MUCH

wiring of your TV? The fleece in the front closet? The telephone in the kitchen? Without petrochemicals, none of these things would be the same. Most wouldn't exist at all.

Where does this stuff come from?

The oil and natural gas that go into petrochemicals are nothing more than the remains of ancient plants and animals that have been "cooked" below ground for a million years or more.

Cracking is the process by which various petrochemicals are extracted from crude oil and natural gas. Natural gas, for example, separates into four "fractions" called methane, ethane, propane and butane. Propane – the same stuff that fires up a barbecue – can be broken down further into many substances with extremely long, forgettable names that form the chemical building blocks of everything from antifreeze to plastics to detergent. The same is true of every petroleum fraction.

There are hundreds of petrochemicals derived from crude oil and natural gas, and the number of everyday items made from those petrochemicals has been estimated at 3,000 or more.

And where does it all go?

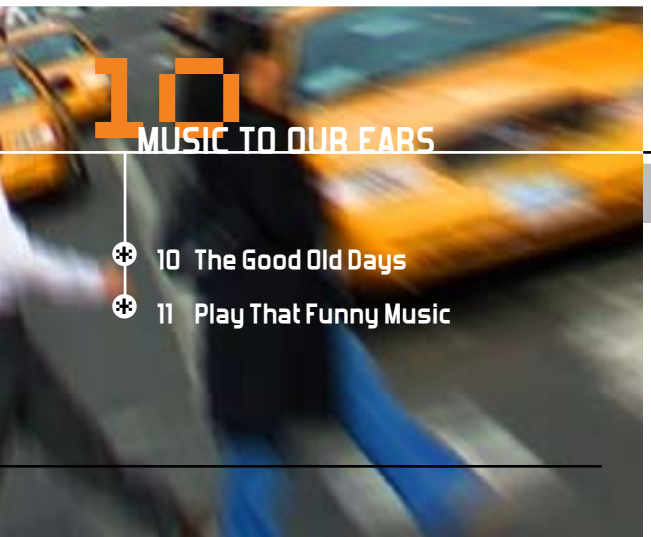
When your parents were young (use your imagination here), everyone treated our environment with less respect than it deserved. Those days are gone.

Today, the oil and gas sector is a leader in the development of environmentally-friendly ways of doing business. This covers everything from using less land for wellsites to avoiding grizzly bear habitats when building roads to supplying raw materials used in the manufacture of products that can be used time and again. Environmental stewardship is no longer an option. It's becoming a way of life.

Consider one small example that pays huge dividends. Every plastic item in your home has a code stamped on it (a "chasing arrows" symbol surrounding a number) identifying the raw materials used to manufacture it. This makes it easy to sort and recycle used items. The result is less energy use, less waster, less pollution, and less consumption of new raw materials. For every nine pop bottles that we recycle, for instance, we save about 4.5 litres of oil, eliminate half a tonne of air emissions, and save precious space in landfills. Our world is better off for the thoughtfulness behind that tiny symbol.

So whether we're talking about the convenience of the nylon backpack you carry every day, the appeal of an iMac's* glow, or the importance of a new heart valve for your grandmother, the petroleum industry has given extraordinary quality to our ordinary lives.

**iMac is a trademark of Apple Computer, Inc*



10 MUSIC TO OUR EARS

individual

ACTIVITY

CHEAPER THAN WATER?

Research the price of five consumable liquids, such as bottled water, pop, juice, milk and iced tea. Convert their prices to cents per litre. Now find out how much a litre of gasoline costs at a local service station. How do the prices stack up? Create a colourful bar graph that compares the prices of all the liquids, from lowest to highest.

PETROCHEMICALS AT HOME

Choose one room in your home and conduct an analysis of the petroleum-based products you find there. Use the items listed to help you in your search. Put a check mark beside all the items you find. Can you find anything that is not on the list? Can you find any products that have petroleum-based packaging? Compare your lists to the lists of others in your class. Make a class list of all the petroleum-based items you found that are not listed here.

individual

ACTIVITY

KITCHEN CHEMIST

Before toiletries were available at the local drug store, people made their own. Here's a chance for you to **make** your on hand cream. All of the following ingredients should be available or can be ordered from your local pharmacy. Safety note: All chemical products should be appropriately labelled and stored.

MATERIALS

Graduated cylinder or measuring cup
Balace
Double boiler
Stirring spoon
Eggbeater
Small jars

INGREDIENTS

30 g	cetyl alcohol*
10 ml	glycerine*
5 g	sodium lauryl sulphate*
5 ml	anhydrous lanolin
250 ml	distilled water

OPTIONAL INGREDIENTS

10 ml	rose water substituted for 10 ml. distilled water food colouring

PROCEDURE

1. Melt the first four ingredients in a double boiler.

   Stir until the ingredients have melted together.
2. Remove the mixture from the heat.
3. Add the heated water to the mixture and stir.
4. Add the optional rose water and food colouring.
5. Stir mixture with eggbeater only until slightly thickened.
6. Pour the hand cream into small jars while it is still warm and liquid.

**petroleum product*

Kitchen

Ammonia/window cleaner
Appliances
Candles
Cleansers
Countertops
Dishwashing liquid
Flashlights
Gas stove
Ice cube trays
Lunch boxes
Mops and brooms
Plastic containers
Plastic wrap
Pop bottles
Sandwich bags
Shopping bags

Bedrooms & Closets

Cameras
Clocks
Cosmetic cases
Hangers
Luggage
Pillows
Polar fleece
Rain coats
Shoe polish
Shoes
Ski jackets
Synthetic fibres in clothing & bedding
Umbrellas
Zippers

Living Room & Den

Ballpoint pen barrels
Board games
CDs, CD player
Computers, Laptops
Glues & parts in furniture
Pet toys
Piano keys
Rugs stereos
Telephones
Televisions
Upholstery
Venetian blinds
Videotapes

Bathroom

Antihistamines
*Aspirin**
Bandages
Bathtub
Combs & brushes
Deodorant
Eye shadow, Lipstick
Flashlights
Hair dyes
Mascara
Nail polish
Perfumes
*Vaseline***
Rubbing alcohol
Shampoo
Shaving cream
Shower curtains
Shower stall
Soap
Toilet seats
Toothbrushes, Toothpaste

Personal Items

Cell Phones
Contact lenses
Credit cards
Dentures
Eyeglasses
Hearing aids
iPod
Sunglasses

Buildings

Awnings
Baseboards
Caulking
Ceiling tiles
Doors
Electrical cable coverings
Glues in plywood & panel boards
Moulded window frames
Paints
Plastic pipes & fittings
Plumbing fixtures

Yard, Garden & Garage

Asphalt driveway pavement
Bicycle tires & helmet
Electrician's tape
Fishing poles
Garage doors
Golf bag & balls
Hose
In-line skates, knee pads & wrist pads
Life-jackets
Fuel for lawn mowers & snow blowers
Nylon rope
Pet kennels
Plastic garden tools & lawn Furniture
Pool liners
Recycling containers
Skis, ski boots & goggles
Sleeping bags
Synthetic rubber boots
Tennis racquets & balls
Tents
Tool boxes

Car

Antifreeze
Car body
Carpets
Children's car seats
Dashboard
Fan belt
Oil Filter
Seat covers
Tires

Furnace & Laundry Room

Detergents
Fabric softners
Heating oil or natural gas heat
Laundry baskets
Natural gas for hot water tanks and clothes dryers

**Aspirin is a trademark of Bayer AG*

*** Vaseline is a trademark of Lever Pond's*

individual

ACTIVITY

LIFE WITHOUT PETROLEUM

Now that you know what is made from petroleum and petrochemicals, **write** a 300-word essay titled "A World Without Petroleum Products". **E-mail** the essay to a friend or two and ask for their reactions.

SOMETHING TO SINK YOUR TEETH INTO

partner

ACTIVITY

BUBBLE GUM WORLD

With a partner, go to your local store and survey the chewing gum selection. **Write** down all the different brands, flavours and formats available. How many different chewing gum choices were available at that store? **Graph** your results and compare them with classmates who surveyed a different store. You probably found out there is a lot of gum available. **Research** the chewing gum industry. What are the biggest gum companies in the world? Where are they located? How much gum do they sell every year? Where do they sell the most product? How much is the chewing gum industry worth?

In groups of two or three, **conduct a survey** outside the store you researched for its chewing gum selection. Say to the first 50 people you see: "Hello. We are doing a survey for school. Can you please tell us whether you chew gum a lot, a little or not at all?" Thank people for answering. Keep a record of your responses. Back at school; compile your results and those of your classmates to create a large bar graph. Do the people you interviewed chew gum or not? What about the people in your class; do they chew gum? From your research, can you make any predictions about the future of the chewing gum industry from your neighbourhood's perspective?

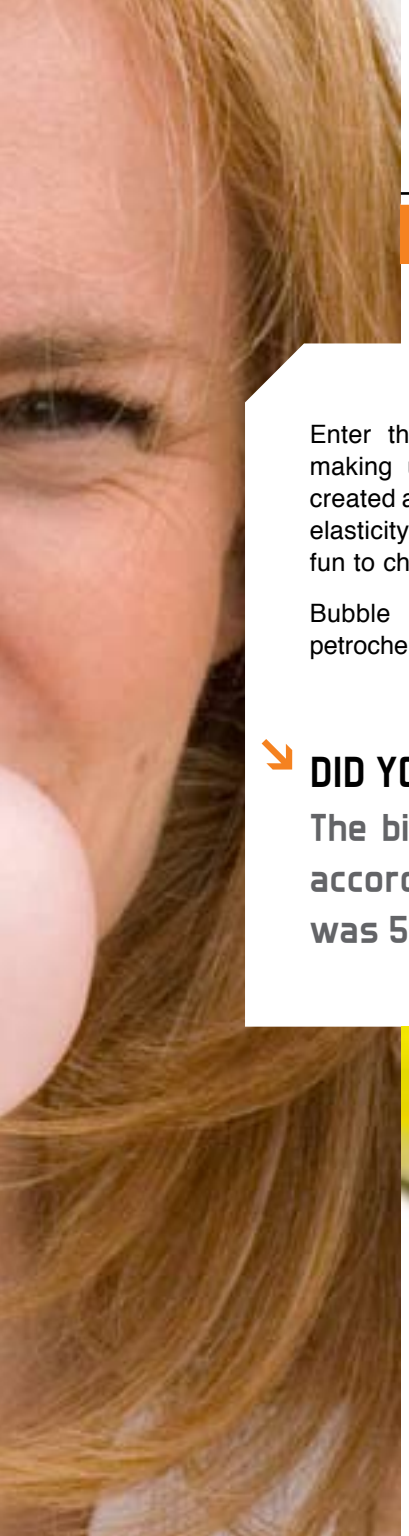
Blowing basketball-sized bubble gum bubbles is a matter of chemistry — petrochemistry!

How can that be? Chewing gum has three basic ingredients: a gum base, sugar (or artificial sweetener), and flavourings. The sugar and flavourings are no help at all when it comes to blowing big bubbles; in fact, talk to any bubble expert and you'll hear that sugar is a bubble's number one enemy. The secret to blowing bubbles that really rock is the gum base. It is the gum base that increases chewing gum's amazing ability to stretch and stretch without bursting.

Over the years, chewing gum bases have consisted of some surprising things. Nine thousand years ago, our cave-dwelling ancestors were extremely fond of popping wads of black birch-bark tar into their mouths. (Archaeologists who specialize in tooth impressions say that most of these Early Mesolithic chewers were six- to 15-year olds.) Thousands of years later, the ancient Greeks were chomping away on the resin of the mastic tree.

Central American Mayan Indians chewed chicle, the rubbery sap of the sapodilla tree. And Canadian Aboriginals picked up spruce gum at their neighbourhood convenience trees.

In North America, spruce gum gradually gave way to paraffin wax and then to chicle. But during the Second World War, demand for rubber took a big bite out of worldwide chicle supplies.



individual

ACTIVITY

STICKY SITUATION

Choose one of the following themes to investigate. Clip image from newspapers or magazines of petroleum-based products that fit within your chosen theme. For example, in the sports equipment theme, you might find photos of runners, in-line skates, helmets or swimming goggles. Create an interesting collage by gluing your clipped images onto a large sheet of paper. Write an attention-grabbing caption somewhere on your collage.

THEMES

- Cosmetics and personal hygiene supplies
- Food and food containers
- Computer equipment
- Safety and medical equipment and supplies
- Clothing Yard
- Garden
- Cars and their components ·
- Entertainment ·
- Sports equipment

Enter the industrial chemists who were already experts at making useful new products out of petroleum. They quickly created artificial bases that made even better gum that increased elasticity, held flavour longer, and just plain made the gum more fun to chew.

Bubble gum bubble blowers have been thanking those petrochemists ever since.

DID YOU KNOW?

The biggest bubble gum bubble ever blown, according to the *Guinness Book of World Records*, was 58.4 cm in diameter!

DID YOU KNOW?

Glue is also a petroleum-based product!

POLAR FLEECE

A NEW SPIN ON AN OLD BOTTLE

Everyone and his dog is wearing fleece.

The warm, fuzzy fabric now clothes everyone from Tommy Hilfiger's sleek models on the catwalks of New York City to extreme athletes on the summit of Everest. It is the stuff of skiers' headbands, wetsuit linings, doggie blankets, and astronaut underwear.

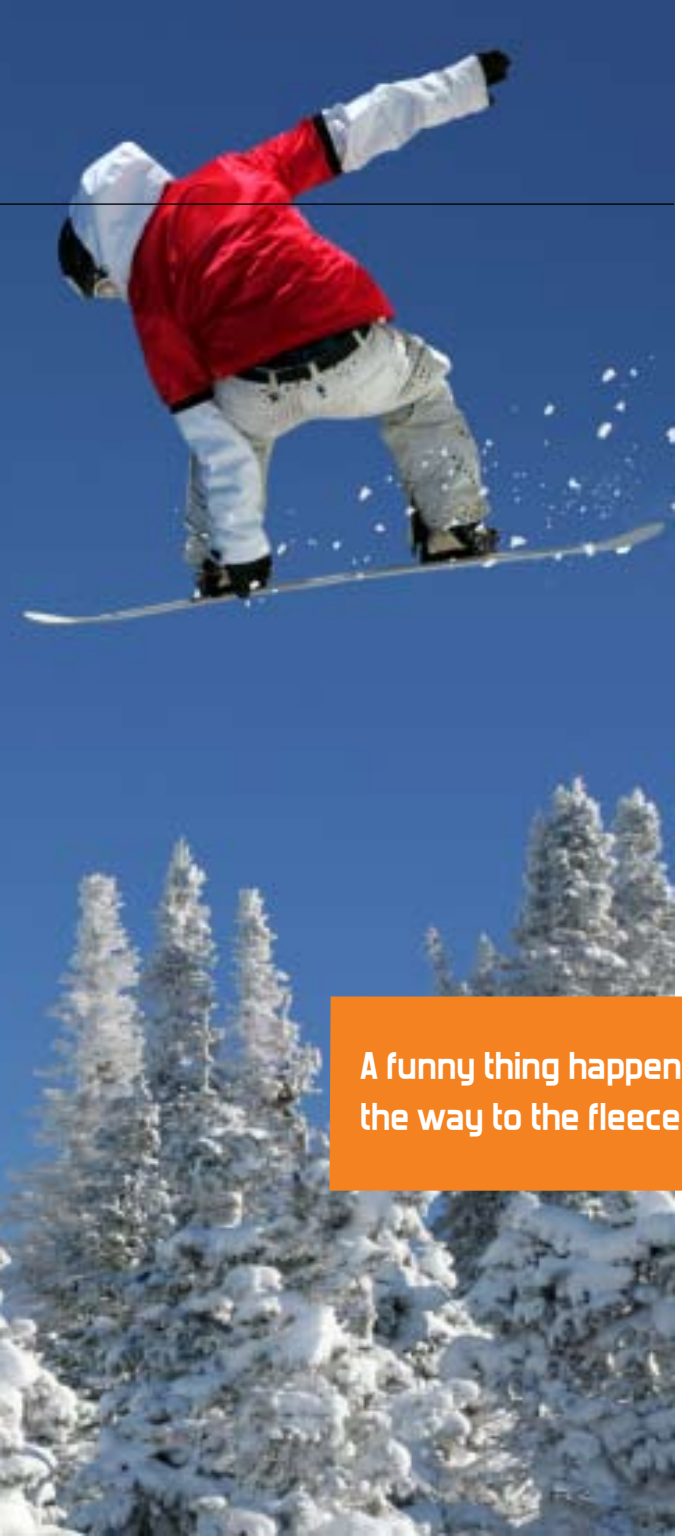
What you may not realize is that fleece comes from the oil and gas deposits beneath your feet. That's right – you're wearing petroleum.

Almost all fleece comes from plastic pop bottles, which are made from polyethylene terephthalate. That stuff (the name is way too long to say it again) comes from natural gas, which Canada has in abundance. When you return your empties to the recycling depot, they are sold to companies that trade in used plastic.

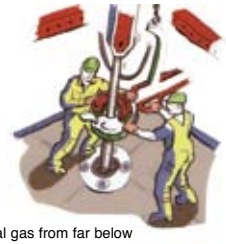
Those firms grind the bottles into 'flake' or granular plastic that can be turned into fine fibres. The fibres are then usually compressed and baled and sold to a fabric mill. At the mill they are knitted together, dyed and made into the synthetic fleece garments that you buy off the rack.

About 25 two-litre pop bottles go into one fleece jacket. About 80 per cent of the plastic pop bottles that Canadians buy eventually find their way to a recycling depot – the first stop on their journey to a fabric mill.

Manufacturers can also recycle your worn-out fleece into new fleece products. This creates a fabric that rivals virgin polyester in quality, uses 60 per cent less plastic, and produces four times less carbon dioxide and six times less sulphur than the original. Pretty impressive.



A funny thing happens on the way to the fleece factory.



1 Natural gas from far below the Earth's surface is the raw material of the two-litre pop bottles that eventually become synthetic fleece you can wear.

2 After the gas is pumped to the surface, pipelines carry it to a processing plant that breaks it down into many useful substances.

3 Polyethylene, one of the most important building blocks of the plastic industry, is often converted into pellets for shipment by rail.

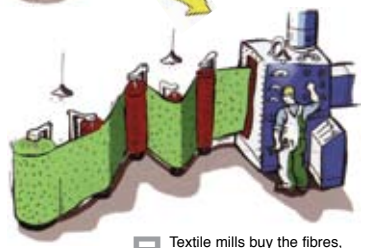
4 The polyethylene pellets find their way to plastics manufacturers around the world.

5 Manufacturers make the pellets into small tubes and blow them up like balloons to make pop bottles and other containers.

6 Bottlers buy the bottles, fill them with carbonated soft drinks and ship them to grocery and convenience stores everywhere.

7 When you recycle your empties, you set the all-important recycling process in motion.

8 That process takes your discarded bottles and, after many intermediate steps, converts them into fine fibres.



9 Textile mills buy the fibres, knit them together and dye them every colour of the rainbow.

10 Clothing companies then design and manufacture cozy fleeces that find their way into the retail market and, eventually, your closet.

11 And when you're finished with the fleece, you can do the responsible thing and start the recycling process all over again.

Artist rendering. Process may not be exactly as shown.

MUSIC

TO OUR EARS

individual

ACTIVITY

THE GOOD OLD DAYS

Interview your grandparents or an older neighbour. Ask them questions about "the good old days" before we had so many petroleum-based products. They may have to think about how their own parents or grandparents lived to answer your questions. Ask questions like:

- "Before cassettes and CDs, how did people listen to music?"
- "Before plastic wrap, how did people keep food from spoiling?"
- "What kinds of things were in your house that we don't have around anymore?"
- "What was a luxury item when you were young?"
- "What is a luxury item for you today?"
- "What do we have in classrooms today that didn't exist when you were in school?"
- "What was good about the good old days? What wasn't so good?"

Write a lifestyles magazine article describing your interview and what you found out. Make sure you include a general idea of the time frame the person you interviewed was talking about.

DID YOU KNOW?

The Beatles hold the record for the most #1 hits. Their songs have been available on albums, 45s, 8-track tapes, cassettes and CDs!

Whether your musical taste runs to the trash metal sound of Metallica or the upbeat diva-in-training tunes that accompany Britney Spears' navel, petroleum is behind much of your listening pleasure.

The music business has come a long way since 1877 when Thomas Alva Edison used cylinders of tinfoil to record his own rendition of "Mary Had A Little Lamb". In the decades that followed, producers tried substances ranging from steel wire to chocolate as recording media and played music back on everything from reel-to-reel tape recorders to continuous-loop eight-track stereos. Almost all of the best musical inventions used petroleum in a big way and they still do.

To get some idea of what this means, consider MP3 players and iPods. Now imagine them without their plastic cases, the insulation on the wiring inside, the headphones that came with them, and the blister, skin or clamshell packs in which they were packaged. All this stuff was, at one time, petroleum. Same goes for CD players, the CDs themselves and the jewel cases the CDs came in, all once petroleum.

Why are petroleum-based materials used so much in today's music machines? Because they look cool, they're tough to break, and they're often cheaper than a new pair of jeans. And why are petroleum-based media used so extensively for recording? Because they sound fantastic.

So the next time your parents tell you to turn down the music, remind them how lucky they are to have such amazing sound at all.

individual

ACTIVITY: PLAY THAT FUNKY MUSIC

Record music has been around for 130 years. For the past 60 years, all forms of recorded music have been petroleum-based. Here's a quick run down of the technology of recorded music:

1870s	1890s and 1900s	1920s and 1930s	1940s and 1960s	1960s and 1970s	1960s and 1970s	1970s and 1980s	1980s to today
Cylinder "talking machine"	Radio	Disc phonograph/ gramophone/78s	LPs/33s/record albums	45s	8-track tapes	Cassettes	CDs, music videos, MP3s, iPods

A lot of old records and tapes are still around. **Find** samples or photographs of some of the forms of recorded music in the list. Your parents or grandparents may be a great source! **Bring** your records and tapes into class.

IMAGINE THIS

The source of so much.

Fantastic tunes, yummier food, less pain, safer cars, fabulous entertainment, clothes that go on and on: all this and more is yours every day because oil and gas wells are drilled, pipelines are buried, refineries are built, and high-tech research is done.

So stop for a moment and take a good look around you. Petroleum is the source of so much in your life. Now try to imagine your world without these things. Not easy, is it?

Petroleum. More than just fuel.

Centre for Energy™

Copyright 2009 Canadian Centre for Energy Information

This publication is provided for education purposes and is available as a free download from the Centre for Energy's Web portal at http://www.centreforenergy.com/Education/

Professional elementary, secondary and post-secondary school educators and their students may download, use and copy portions of this publication for the limited purpose of instruction and study provided that such copies include this copyright notice. Copyright to all photographs and illustrations, except where noted belongs to the Canadian Centre for Energy Information.