FOAM BOOK

INFORMATION ABOUT SPRAY FOAM BOOK 4

INSIDE: **a high performance SPF system that advances sustainability in homes.**

Covestro's Spray Polyurethane Foam contribution to Covestro's **Sustainable Development Program**

What is Sustainable Development?

Sustainability is an abstract concept subject to interpretation.

Covestro defines sustainability as follows:

- Sustainability is an attribute of a system
- Sustainability is achieving commercial success through solid business models in a way that meets the needs of our employees, society, and protects the environment and natural resources
- Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs

Pillars of Sustainability

- **Environmental**
- **Social**
- **Economic**

At the 2005 World Summit it was noted that sustainability requires the reconciliation of environmental, social and economic demands - the "three pillars" of sustainability. This view has been expressed as an illustration using three overlapping ellipses indicating that the three pillars are not mutually exclusive and can be mutually reinforcing.

Source: Johann Dreo - Sustainable development 2006

Environmental Sustainable Development

What we know:

- Fossil fuels are a finite source of energy
- Burning fossil fuels emits green house gases
- Energy efficiency in buildings conserves resources such as fossil fuels
- Buildings insulated with spray polyurethane foam will typically use 30 percent less energy for heating and cooling.*

*compared to buildings insulated with traditional fibrous insulation material. Source DOE Air sealing

Fossil Fuels

Fossil fuels are a finite resource being depleted from the earth.

By conserving energy, we can slow down the depletion of fossil fuel, giving time to develop long-term solutions to meet energy needs for the future.

Insulating our homes and buildings conserves the fossil fuels needed to heat and cool them.

Environmental Sustainability

Buildings are responsible for more than **40 percent** of global energy use and **one-third** of global greenhouse gas (GHG) emissions in both devloped and developing countries.

Industry & manufacturing
32%

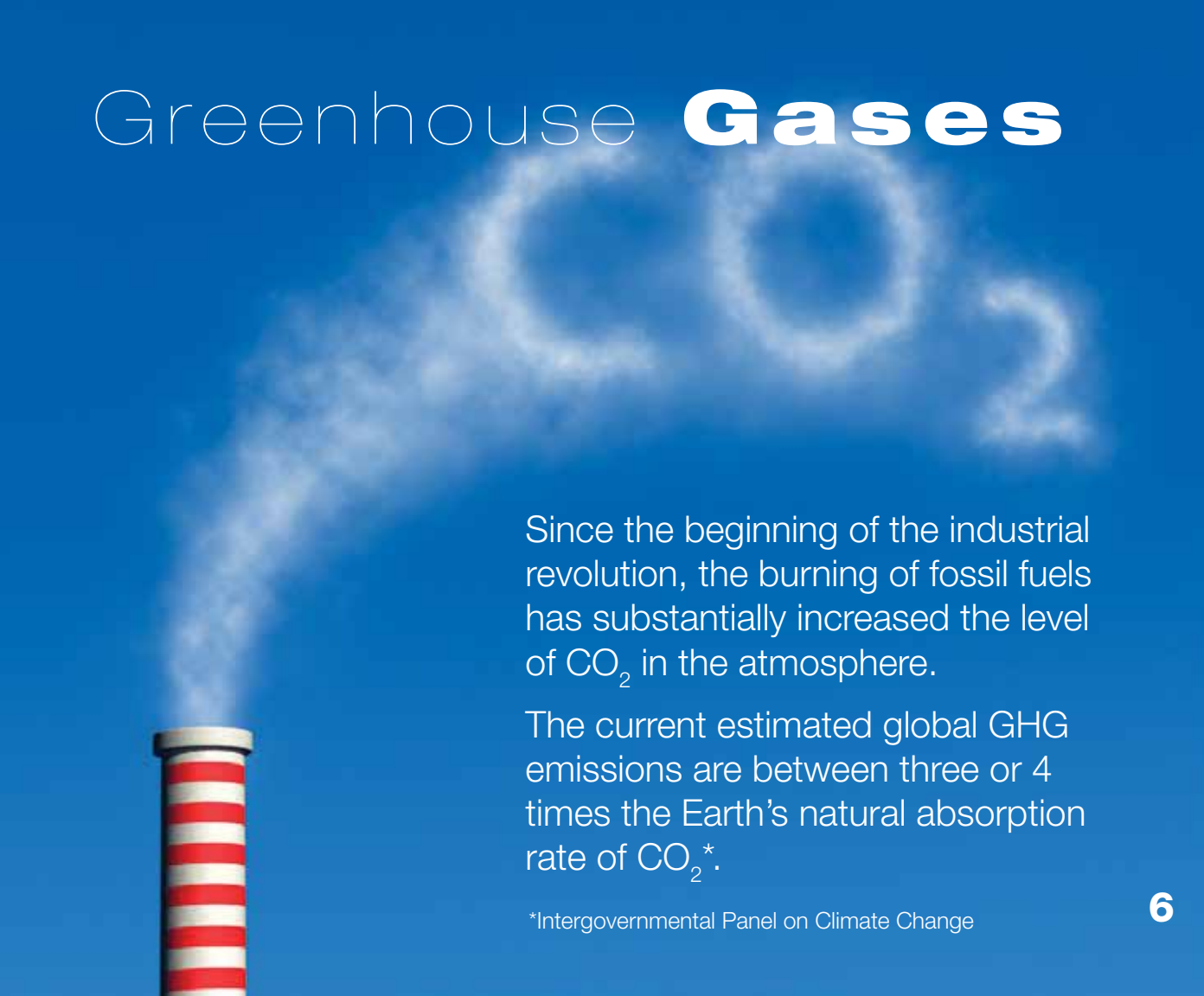
Transportation
28%

Commercial
18%

Residential
22%

Source: US Energy Information Administration 2008

Greenhouse **Gases**



Since the beginning of the industrial revolution, the burning of fossil fuels has substantially increased the level of CO_2 in the atmosphere.

The current estimated global GHG emissions are between three or 4 times the Earth's natural absorption rate of CO_2*.

*Intergovernmental Panel on Climate Change

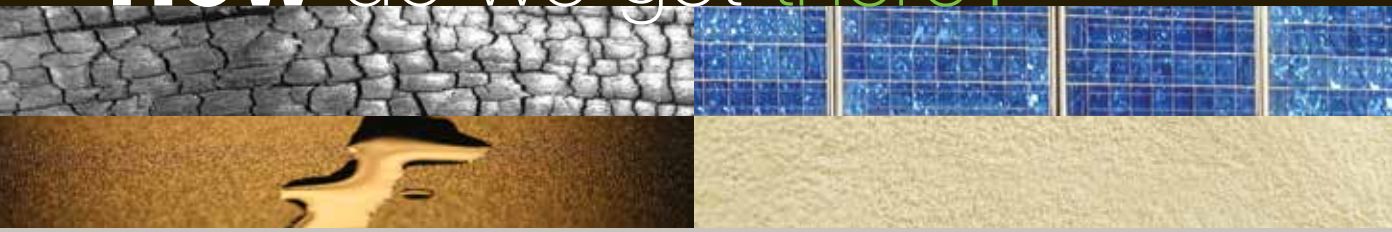
The Challenge

The challenge is to conserve fossil fuels and reduce the CO_2-equivalent emissions in the atmosphere.

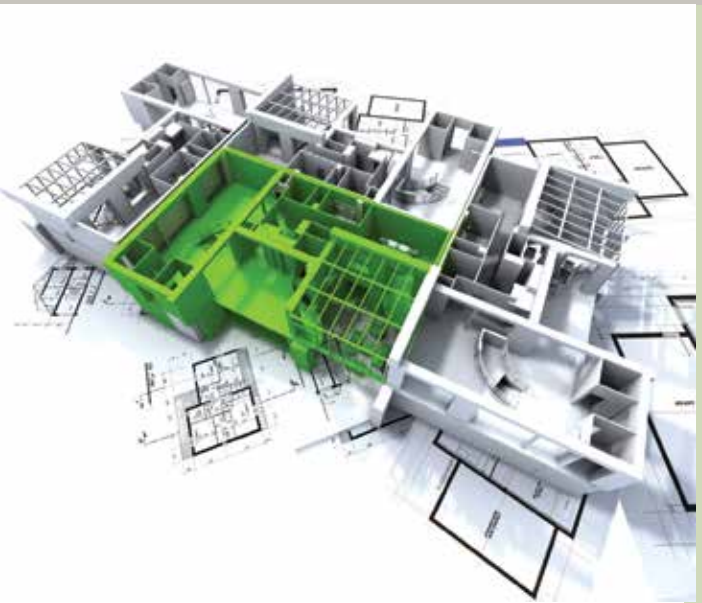
This will require changes in the way society produces, consumes, regulates and behaves.

This challenge will require us to meet these goals without compromising future generations - the practice of sustainable development.

How do we get there?



Studies show what can be done to reduce our need for fossil fuels and reduce GHG* emissions.



Improving the energy efficiency of buildings was found to be an economically sensible strategy for reducing GHG emissions and fossil fuel usage.

*GHG - Green House Gas

*McKinsey and Company December 2007– Reducing US Greenhouse Gas Emissions How Much at What Cost?

*International Council of Chemical Associations July 2009 - Innovations for Greenhouse Gas Reductions. A life cycle quantification of carbon abatement solutions enabled by the chemical Industry.

McKinsey Study

Abatement Cost Curve

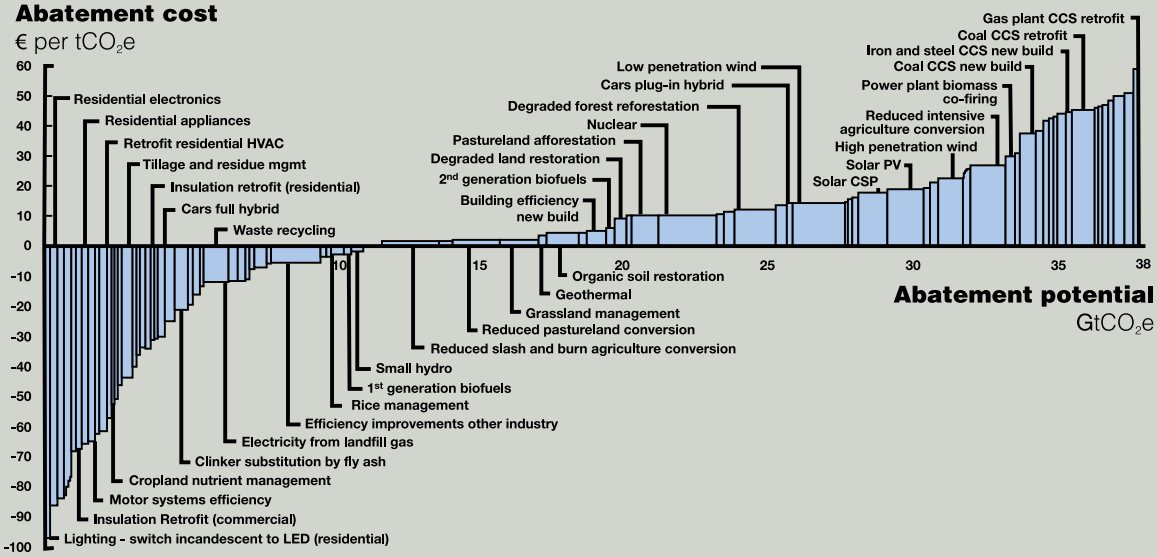
This study finds there are many levers available that will, when acted upon, reduce some GHG levels.

All levers below the horizontal line make good economic sense as they indicate potential savings and minimal costs.

All insulation references are below the horizontal line and show potential savings.

McKinsey Study

Global GHG abatement cost curve
Global GHG abatement cost curve beyond 2030 BAU
Cost of abatement below EUR 60 per tCO_2e



Note: This is an estimate of the maximum potential of all technical GHG abatement measures below EUR 60/tCO_2e, if each lever was pursued aggressively, not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.0, McKinsey & Company

Life Cycle Assessment

Life Cycle Assessments (LCA) for some individual chemical product applications, including insulation, were calculated in the ICCA* report.

The life cycle assessment is a recognized multi-step, well-structured methodology that performs environmental impact analysis (based on ISO 14044:2006).

LCA assess energy and environmental impacts of a material in a specified application from cradle to end-of-life.

LCA results support decision-making on new projects and compare the energy and environmental impact of different products with quantitative data factoring in all the life cycle phases.

* International Council of Chemical Associations

Life Cycle Assessment

LCA performed on insulation products have demonstrated that energy savings during the use phase far outweigh energy associated with manufacturing the raw material, formulating components, transporting, installing and managing at end-of-life.

See Energy and Environmental Benefits of Insulating Commercial Buildings with Polyiso at www.bayermaterialsciencenafta.com for an example of an LCA.

Spray Foam Insulation

Saving Energy, One Spray at a Tme...

SPRAY POLYURETHANE FOAM ALLIANCE
SPFA

Spray foam insulation saves energy during insulation use that far outweighs energy associated with manufacturing raw materials, formulating spray foam components, transporting, installing and managing spray foam at end-of-life.

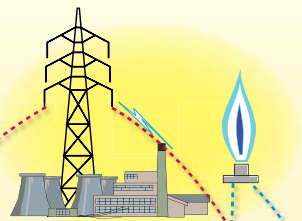
James Lambach and George Pavlovich
Covestro LLC • 1 Covestro Circle • Pittsburgh, PA 15205

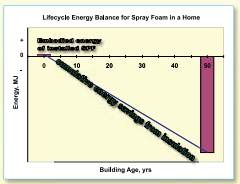
Electric Power Plants:

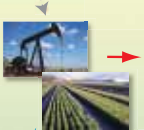
US power grid mix includes coal, natural gas, fuel oil, nuclear energy, hydropower, biomass, wind, geothermal energy, etc. 3.2 KWh of "source" energy are needed for 1 KWh of electricity delivered to the "site".

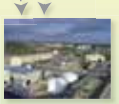
Natural Gas:

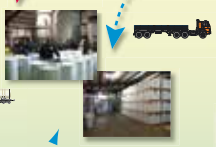
Includes all activities required to extract, produce and deliver thermal energy to customers. 1.16 Btu of "source" energy are needed for 1 Btu of gas delivered to the "site".

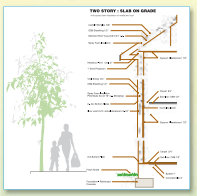












Functional Unit: Spray foam insulation with a minimum thermal resistance specified by code on the walls and roof of a standard two-story (approx. 2,500 square foot) residential house, with a 50-year insulation life.

Raw Material Extraction and Refining:

Involves extraction of crude oil and natural gas, mining of coal, cultivation of crops, refining of crude oil into benzene, pentane, diesel, propane, etc.

Raw Material Manufacture:

Includes processing of raw materials for making chemicals such as diphenylmethane diisocyanate (MDI), polyester polyol, blowing agents, and additives such as flame retardants and catalysts.

Spray Foam Formulation:

Chemical raw materials are containerized or blended to prepare Components A and B. Component A (MDI) is containerized and Component B is formulated (a blend of polyols, catalysts, surfactants, blowing agents) and containerized for shipment to the installer or building site. Transportation of spray foam insulation components is very efficient, as dense liquids are shipped. Since insulation is produced by combining these liquid components at the building site, large volumes of air-containing insulation do not need to be shipped, saving energy and fuel costs.

Spray Foam Installation:

A 50:50 mixture by volume of Components A and B are combined in a spray nozzle at the building site, where the components react as the material is sprayed onto the roofs and walls of a house. The insulation expands in seconds as it is sprayed onto the structure, completely filling the spaces between the studs and providing a tight thermal seal over the walls and roof.

Insulation Use Phase:

Energy savings are readily estimated using building energy simulation models. As illustrated in the graph above, the embodied energy, i.e. energy used to make, transport, install and dispose of the insulation at end-of-life is minimal compared to the cumulative energy savings over the life of the insulation. In addition to providing significant energy and cost savings, spray foam insulation has many other advantages, including less air and moisture infiltration, reduced HVAC system capacity requirements, added strength to the structure and integrity of the building envelope, sustained performance from insulation that does not sag over time, attenuation of outside noise, and durability that lasts for decades.

Embodied Energy & GWP:

Life cycle inventory methods based on ISO 14040 can be used to estimate "cradle to end-of-life" energy and from manufacturing, transporting, installing and managing spray foam at end-of-life.

End-of-life (EOL):

Involves transportation to and disposal of insulation in a local solid waste landfill.

up to 365 days = 1 year | 18,250 days = 50 years | 30 days = 1 month

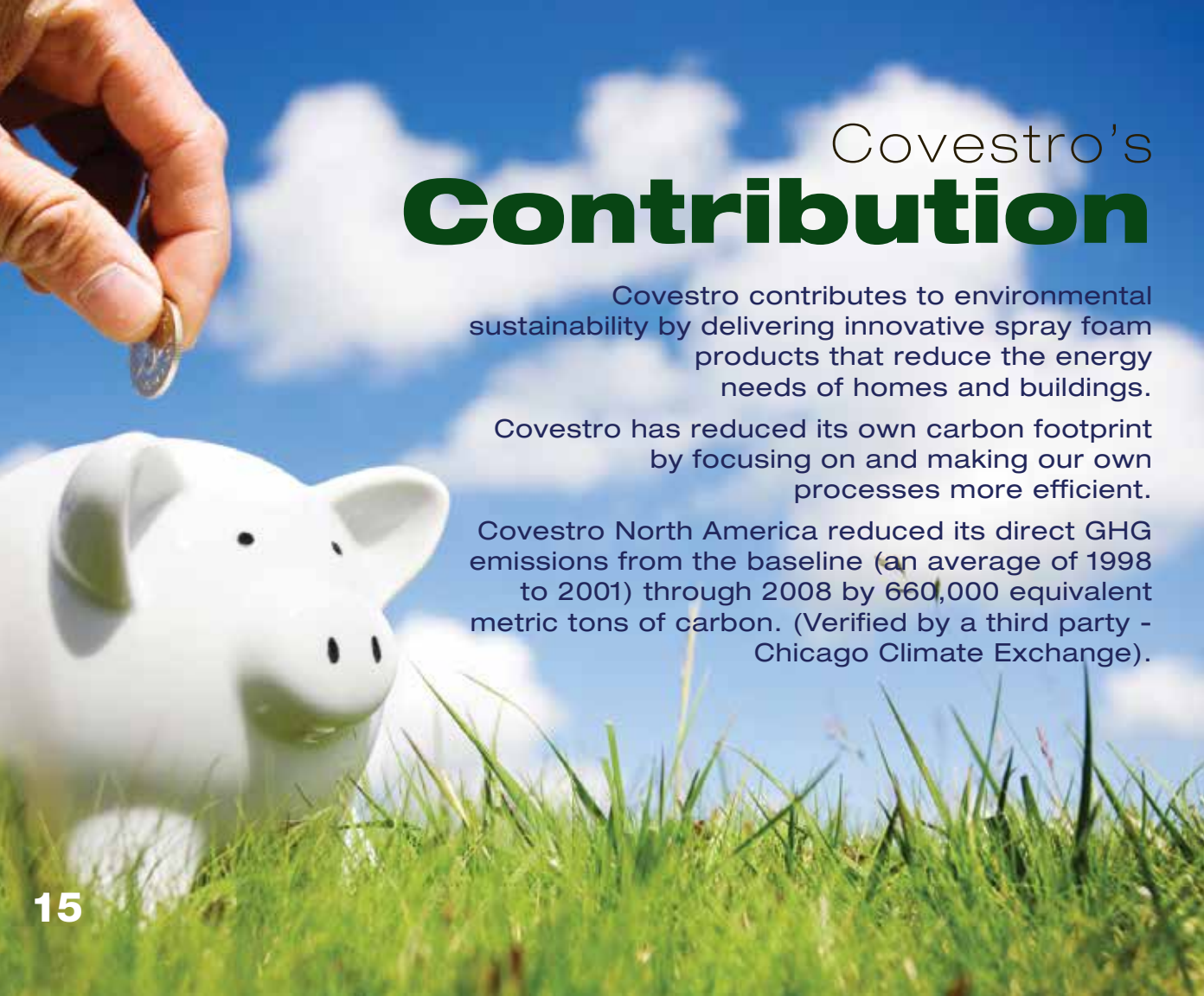
Designed by Bayer Print & Design Services Group

Life Cycle Assessment

- LCA calculations show that the highest values obtained with an increase of insulation can contribute substantially to energy efficiency improvement.*
- Insulation contributes to fossil fuel conservation and GHG reduction.

*ICCA - Innovations for Greenhouse Gas Reductions July 2009

GHG



Covestro's Contribution

Covestro contributes to environmental sustainability by delivering innovative spray foam products that reduce the energy needs of homes and buildings.

Covestro has reduced its own carbon footprint by focusing on and making our own processes more efficient.

Covestro North America reduced its direct GHG emissions from the baseline (an average of 1998 to 2001) through 2008 by 660,000 equivalent metric tons of carbon. (Verified by a third party - Chicago Climate Exchange).

Social Sustainable Development

Social sustainable development is Covestro's commitment to help our employees, customers, and neighbors to meet their changing personal and professional needs. Some of the ways Covestro does this are as follows:

- Providing guidance in Safety and Health
- Sharing Best Practices within the industry
- Community Outreach Program

Social Sustainable Development

Guidance in Safety and Health

- EPA recognized Covestro for its leadership in product stewardship for spray foam in a teleconference following Covestro's award-winning presentation at the American Chemistry Council's Center for Polyurethane Industry Polyurethanes 2010 Technical Conference on time limits for safe re-occupancy.
- Covestro collaborated with the Spray Polyurethane Foam Alliance (SPFA) and the Center for the Polyurethane Industry (CPI) to launch product stewardship programs and participated on several workgroups.

www.sprayfoam.org, www.spraypolyurethane.org

Social Sustainability Development

Covestro

Direct Involvement with Trade Organizations:

PIMA - Polyisocyanurate Insulation Manufacturers Association
ACC - American Chemical Council
CPI - Center for the Polyurethane Industry
ABAA - Air Barrier Association of America
AIA - The American Institute of Architects

Social Sustainability Development

Community Outreach

Girls Hope House in New Orleans, LA

- Application of spray polyurethane foam in a home destroyed by Hurricane Katrina provided a significant savings in the annual energy bill.

Hurricane Katrina Revitalization, Long Beach, MS

- Combination of Spray Polyurethane Foam and steel frame construction completed the mission of creating new building structures able to withstand storms like Hurricane Katrina in the future.

Garfield Manor Detroit, MI, part of Sugar Hill District Urban Renewal

- Spray Polyurethane Foam, along with other energy efficient strategies such as solar power, geothermal walls, white roof, and rainwater harvesting were used in this sustainable redevelopment.

Habitat for Humanity – Cresco, PA

- Application of spray polyurethane foam in a Habitat for Humanity home, providing a 30-50 percent reduction in the monthly utility bills.

Economic
Sustainable Development

Covestro is a large, global, healthy, and viable business with a solid financial future.

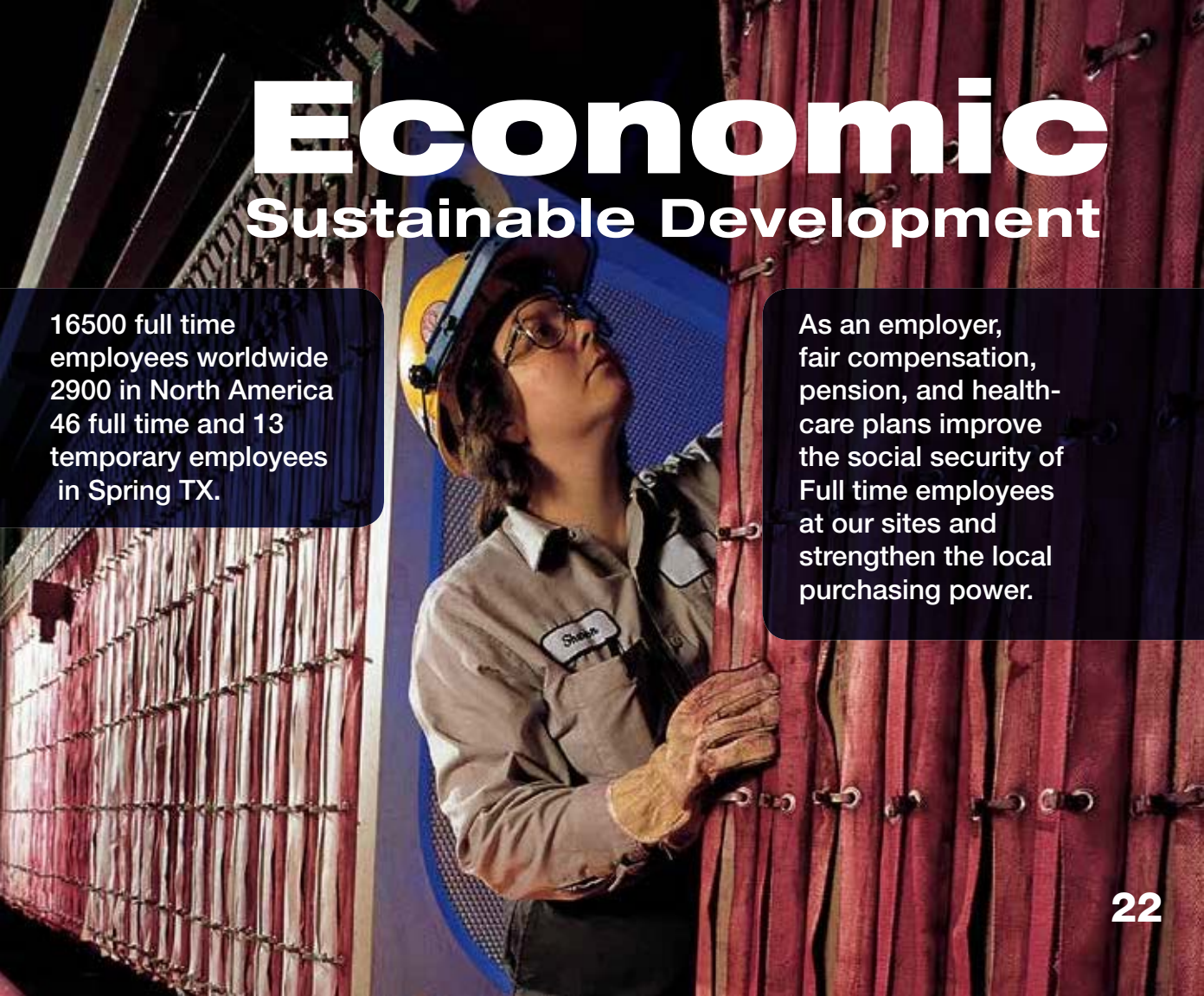
Covestro will have the opportunity to be an economic contributor to its community.

Economic

Sustainable Development

- Focused development on new products
- Research and Development is a driving force
- Innovations are essential for future growth

Economic
Sustainable Development



16500 full time employees worldwide
2900 in North America
46 full time and 13 temporary employees in Spring TX.

As an employer, fair compensation, pension, and health-care plans improve the social security of Full time employees at our sites and strengthen the local purchasing power.

Sustainable Development

Sustainable Development is a path forward that allows humanity to meet current environmental, human, health, economic, and societal needs without compromising the progress and success of future generations.

Sustainable Development policy is a reflection of Covestro's deep dedication to creating products and service that benefit society while meeting social, economic and environmental responsibilities.

Covestro is committed to Sustainable Development and to being a socially and ethically responsible citizen.

Go to www.polyurethanes.covestro.com
to learn more about the competitive advantages
of spray polyurethane foam.

DOWNLOAD:

Product Datasheets
Specifications
Project Profiles
Safety Data Sheets

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