ReNews®
A publication on dialyzer reprocessing volume 12, 2007

How a Dialyzer is Made

100% of the materials that go into making a synthetic-fiber dialyzer are based on a non-renewable resource (plastics made from oil). The fibers are made up of polymers (synthetic resins or plastics) and the case and endcaps are made of polycarbonate plastic. The potting material that secures the fibers at both ends of the case is also a blend of synthetic resins called polyurethane.

The hollow fibers are where the real work of dialysis goes on. The case and endcaps are basically support structures to hold the fibers in place. Each dialyzer has thousands of these fibers. Each fiber is only 150 – 200 microns in diameter on the inside (about 2 - 3 times the diameter of a human hair) and about 12 inches long.


Hollow Fiber

The fibers are made when polymers are extruded out of a spinnerette. Extrusion is what you do when you squeeze your toothpaste tube. The spinnerette is like the neck of the toothpaste tube, except that it squeezes out a hollow tube, not a solid one. The whole process is called spinning, and through careful control of speeds, temperatures and materials, the result is a hollow fiber that has pores (tiny openings) through its walls that are just the right size for letting toxins leave the blood, while keeping larger things like albumin and blood cells behind. The walls are very thin, measuring only 15 – 30 microns in thickness. This is only about 1/3 the thickness of a human hair. Before leaving the spinning area, thousands of these individual fibers are bundled together for assembly into a dialyzer.

The case and endcaps are made from plastic resin that is liquefied by a combination of heat and pressure and then molded into shape. The polycarbonate case is filled with a fiber bundle made up of thousands of fibers. Then temporary caps are put onto the ends of the case and spun in a centrifuge. Liquid polyurethane is fed into openings on the side of the

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Q&A ? ? ? ? ? ?

Oil & Your Carbon Footprint: When foot size *REALLY* does matter!

Q: What is carbon?

A: Carbon is the sixth most common element in the universe and can readily combine with other elements to form millions of different compounds. Human and all living creatures contain carbon. Carbon is essential to life.

Q: What are hydrocarbons?

A: When organic matter decomposes, it produces hydrocarbons (compounds of hydrogen and carbon) in the form of a fossil fuel known as crude oil. Unprocessed crude oil, as it comes from the ground, is not very useful — it must be refined. The refinement process changes the chemical bond between the atoms and molecules and can

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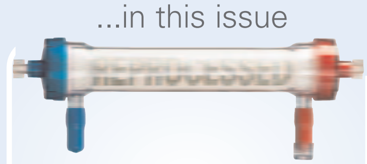

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case, and centrifugal force makes the polyurethane run to each end where it flows around every fiber, sealing each one tightly in place. The polyurethane then hardens, forming the potting material that holds the fibers firmly in place.

During the potting process, some polyurethane enters the ends of the fibers, filling up the lumens and making it impossible for blood to flow through them. The filled ends of the fibers are then trimmed, leaving all the fibers with lumens that are open from one end to the other. The next step in the manufacturing process is attaching polycarbonate endcaps to each end of the dialyzer casing. In the final step, the dialyzer is placed into an outer package, commonly made from an oil-based product, and sterilized.

At each step in the process, natural resources are being consumed and waste is being generated. Among the resources consumed are oil in plastics, water and chemicals in solvents, paper and metal in packaging, and energy for heat and processing. Waste from manufacturing include plastic from the spinning process and dialyzer trimming used solvents, and packaging from raw materials.

Polycarbonate Resin

How Much Goes Into Your Landfill?

A Comparison of Dialyzer & Packaging Waste Generated by Single-Use vs. Multiple-Use Clinics

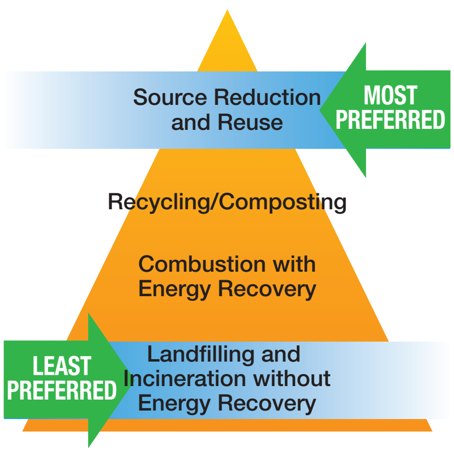
Type of Clinic	Single-use (disposable)	Multiple-use (18 uses/dialyzer)
Stations	12	12
Shifts/day	3	3
Days/week open	6	6
Patient treatments/year	11,232	11,232
Dialyzer & Packaging Related Waste Generated in One Year		
Dialyzers (Infectious medical waste)	11,232	624
Dialyzer outer wrappers	11,232	624
Blood port caps	22,464	1,248
Dialysate port caps	22,464	1,248
Cardboard boxes (12 dialyzers/case) or (Renalin® 4 gallons/case)	936	109 (52 dialyzer + 57 Renalin)
Empty plastic Renalin 100 containers	NA	228 (≈64 lbs.)[a]

Note: The chart does not include waste from miscellaneous reprocessing supplies (gloves, gauze, etc).

[a] Calculated at a rate of 50 reprocessing/container and a weight of 126.4 grams/container

Source Reduction – The Apex of Waste Management

Solid Waste Management Hierarchy



Source: http://www.epa.gov/msw/faq.htm

Source reduction, also called waste prevention, which include reuse, is the most desirable goal of waste management and holds the highest position on the waste management pyramid. Avoiding waste generation, or generating as little waste as possible, is the best waste management practice, both environmentally and economically. When this practice is applied to hemodialyzers, it requires minimizing the number of dialyzers that enter the waste stream. There are two methods to accomplish that task.

One method is to reduce the number of scheduled dialysis treatments for each patient; this method is clearly unacceptable. The other method is using a dialyzer multiple times, thus reducing the total number of dialyzers and accompanying waste packaging that would be generated and sent into the waste stream. Disposal in landfills or incineration without energy recovery is the least desirable goal of waste management and holds the lowest position of the waste management pyramid.[1] A prime example of disposal is the single use of dialyzers, which generates large amounts of medical and packaging waste. Yet, this method is highly promoted and even required by some dialysis facilities.

[1] U.S. Environmental Protection Agency, Frequently Asked Questions about Recycling and Waste Management. Retrieved September 4, 2007, from, *ttp://www.epa.gov/msw/faq.htm*

A Hidden Cost of Disposable Dialyzers

The true cost of any medical product is not just the up-front cost paid to the manufacturer; it also includes the cost of disposal. The cost of disposal will depend on whether the product is classified as medical waste or solid waste. According to a guidance document published in 2004 by the California Department of Health, titled "Greening of the Red-Bag Waste Stream," the cost to process medical waste was $480/ton as compared to only $25/ton for solid waste.[1]

A 12-station dialysis unit with 3 shifts of patients, open 6 days a week, practicing single use, will have 11,232 treatments per year, using 11,232 dialyzers. If the weight of a typical dialyzer after treatment is 1.25 pounds, a single-use facility will generate 14,040 pounds of dialyzer related medical waste per year. At $480/ton, the cost for disposing of those dialyzers will be $3,360/year.

The same size facility that practiced reprocessing will generate considerably fewer dialyzers that need to be disposed of as medical waste. With an average of 18 uses/dialyzer, only 624 dialyzers will be needed each year. The 624 dialyzers will constitute 780 pounds of medical waste. At $480/ton, the cost for disposing of those dialyzers will be $188/year. Not only will a reuse facility lower up-front dialyzer costs, it will also pay significantly less in expensive medical waste disposal fees.

[1] Jack McGurk. (2004). Greening of the Red-Bag Waste Stream. Retrieved September 4, 2007, from, *http://www.dhs.ca.gov/medicalwaste/PDFs/MedWasteReductionInterventions3.pdf*

Source Reduction: What "They" Say

Source reduction refers to decreasing the amount of materials and energy consumed in the manufacturing and distribution of products. It maintains the top spot on the waste management hierarchy.

Source reduction stops waste before it starts. Source reduction from a manufacturers view point means reducing the amount of waste and pollutants generated in the production of products.

Source reduction from the view point of a dialysis facility means not purchasing products that you don't need and not purchasing products with excess packaging. Source reduction has economic as well as environmental benefits.

Read what is said about source reduction and then ask, "Which best exemplifies each statement: the use of disposable single-use dialyzers or reprocessing multiple-use dialyzers?

- "Source reduction actually prevents the generation of waste in the first place, so it is the most preferred method of waste management and goes a long way toward protecting the environment."[1]
- "Waste prevention, or "source reduction," means consuming and throwing away less. It includes: purchasing durable, long-lasting goods; seeking products and packaging that are as free of toxins as possible; redesigning products to use less raw material in production, have a longer life, or be used again after its original use."[2]
- "Avoidance or reduction of waste is the highest form of recycling in the broadest sense: it keeps resources out of the waste stream and in the "useful stream." Consumers should keep this in mind when making everyday purchasing decisions."[3]
- "Retail product packages create about half of all packaging waste. The other half is transport packaging – containers for shipping products from manufacturer to purchaser."[4]
- "Source reduction has many environmental benefits. It prevents emissions of many greenhouse gases, reduces pollutants, saves energy, conserves resources, and reduces the need for new landfills and combustors."[5]

[1] EPA, Municipal Solid Waste. Retrieved September 6, 2007, from, *http://www.epa.gov/msw/reduce.htm*

[2] EPA, Municipal Solid Waste. Retrieved September 6, 2007, from, *http://www.epa.gov/msw/reduce.htm*

[3] California Integrated Waste Management Board. Reduce Waste Packaging. Retrieved September 6, 2007, from, *http://www.ciwmb.ca.gov/WPW/Coordinator/Articles/ShipPack.htm*

[4] Minnesota Pollution Control Agency, Source-reduced and Reusable Transport Packaging. Retrieved September 6, 2007, from, *http://www.pca.state.mn.us/oea/transport/about.cfm*

[5] EPA, Municipal Solid Waste. Retrieved September 6, 2007, from, *http://www.epa.gov/msw/facts.htm*

Medical Waste – Who's Responsible?

Responsibility for medical waste doesn't end when a dialyzer is placed in a red biohazard container; it is a cradle to grave issue. Infectious medical waste, also referred to as regulated medical waste, is regulated by the states and federal government. Regulations vary from state to state, and it is the responsibility of the generator of medical waste to follow those regulations.

Even after medical waste leaves the dialysis facility, the generator of that waste may still hold some liability. An example of this liability comes from a case study from a medical insurance company where a medical clinic was held responsible for part of the cleanup expenses when their medical waste hauler accidentally spilled its cargo into a stream. The cost of cleanup exceeded the waste hauler's insurance policy limit and the clinic, as the generator of the medical waste, was held partly responsible.[1]

A generator of medical waste is classified as any person, or company, who produces medical waste.

[1] Environmental - Pollution Liability for the Healthcare Industry. Retrieved on 10/27/06, from, http://www.zurichna.com/zus/zsource.nsf/display?openform&id=612

Q&A

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produce different and more useful variations of hydrocarbons. These more useful forms can be gases, liquids, waxes and polymers. Polymers are long chains of atoms that are bonded together and used in the production of many products, including dialyzers.

Q: What are the issues with fossil fuels?

A: Carbon dioxide (CO_2) is released into the atmosphere when fossil fuels are burned.[1] This increases the amount of greenhouse gases in the atmosphere, and an increase in greenhouse gases leads to an increase in Earth's temperature. Approximately three-quarters of the human-caused emissions of CO_2 into the atmosphere during the last twenty years have been due to burning fossil fuels.[2]

Q: What exactly is CO_2?

A: CO_2 is a compound composed of one atom of carbon and two atoms of oxygen. In addition to CO_2 being released by burning fossil fuels, it is produced and exhaled by animals as part of their metabolic process and is absorbed from the atmosphere by plants during photosynthesis. CO_2 is present in the atmosphere at about 383 ppm (parts per million) and has an important impact as a greenhouse gas because it absorbs solar radiation.

Q: What are greenhouse gases?

A: Greenhouse gases (GHG) are molecules in the Earth's atmosphere that absorb some of the solar radiation that the earth does not absorb but reflects back into the atmosphere. Some greenhouse gases are naturally occurring. Some greenhouse gases are a result of burning fossil fuels and other human activities. In addition to CO_2, methane, nitrous oxide, ozone and fluorocarbons are among other greenhouse gases.

Q: Aren't all greenhouse gases bad?

A: Not really; it depends on the level of greenhouse gases. In fact, greenhouse gases have the effect of helping the Earth retain a certain amount of heat. A certain level of greenhouse gases keeps the temperature on Earth from getting too cold or too warm, if the level of gases in the atmosphere is too low, the overall temperature decreases; if the level of gases in the atmosphere is too high, the overall temperature increases.

Q: What is a carbon footprint?

A: A carbon footprint is the measurement of the impact (footprint) that human activities have on the environment as measured by the amount of greenhouse gases emitted into the atmosphere.

Q: How is a carbon footprint determined?

A: A carbon footprint is determined by the amount of carbon dioxide produced by human activities. Increasing or decreasing the size of a footprint in a dialysis facility is determined by the type of products purchased and used, the day-to-day practices that are followed and the disposal methods followed by the dialysis facility.

Q: How does the production of dialyzers add to the carbon footprint?

A: Carbon is released into the atmosphere by burning fossil fuels for energy and manufacturing of oil-based products. Synthetic-fiber dialyzers are 100% oil-based.

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[1] Global Warming – Emissions; What are Greenhouse Gases? Retrieved August 27, 2007, from, *http://yosemite.epa.gov/oar/globalwarming.nsf/content/emissions.html*

[2] Climate Change 2001: Working Group I: The Scientific Basis. Retrieved August 27, 2007, from, *http://www.grida.no/climate/ipcc_tar/wg1/006.htm*

Q&A

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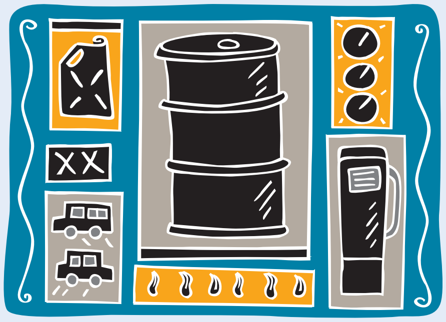
Additionally, carbon emissions are released through the distribution and transportation of those products.Increasing the amount of oil-based products that are manufactured and distributed increases the use of fossil fuels, increases carbon emissions, and thus, increases the carbon footprint.



Q: How much oil does it take to make a dialyzer?

A: The raw materials and energy consumed in the production of dialyzers may vary depending on the size and the exact composition of the components of the dialyzer. All components of a synthetic-fiber dialyzer are made from oil. The casing of a typical dialyzer is made from polycarbonate, a thermoplastic polymer that, when heated, can be molded into a variety of shapes. The materials and energy needed for the production of 1 kg of polycarbonate is the equivalent of 2½ kg of oil.

Q: How does the carbon footprint of a dialysis clinic that reprocesses dialyzers compare to a dialysis clinic that disposes of dialyzers after each use?

A: Many factors need to be taken into account to calculate the carbon footprint.

Among them are:

- Total number of dialyzers needed (up to 18 times more for single-use).[4]
- Amount of energy consumed in the production and distribution of dialyzers.
- Amount of energy consumed in the disposal of dialyzers and packaging.
- Amount of energy consumed in the production and distribution of Renalin® Cold Sterilant used for reprocessing dialyzers.
- Amount of energy consumed in operating the Renatron® Dialyzer Reprocessing Station.
- Amount of energy consumed in the tempering and production of water for the Renatron Station.
- Amount of energy consumed in production and distribution of reprocessing equipment and supplies.

But a snapshot of one dialyzer gives us a start. "A dialyzer contains approximately 180 grams of carbon. The Renalin Sterilant used to reprocess that dialyzer contains approximately 0.18 grams of carbon. This means that the carbon footprint of a single-use dialyzer is 1000 times greater than that of a dialyzer reprocessing cycle. The energy required to produce a dialyzer and the energy required to produce Renalin Sterilant must also be compared. The production of Renalin Sterilant is a low-energy process while the manufacture of polysulfone dialyzers is a high energy process. Additionally, packaging and transportation are also components of the carbon footprint. This adds even greater disparity to the size of the carbon footprint made by single-use dialyzers versus reprocessed dialyzers."[5]

[3] PC – Polycarbonate: Environmental Notes. Retrieved August 27, 2007, from, *http://designinsite.dk/htmsider/m0010.htm*

[4] Based on an average reuse number of 18 uses/dialyzer

[5] Thomas M. Gentle Jr., Ph.D. Director of Chemistry and Microbiology, Minntech Corporation

Product Information


Renatron® II 100 Series

Product Enhancement - Renatron® II 100 Series

The updated Renatron II 100 Series brings all the best features of the original but with enhancements determined by our customers. The Renatron System has been updated on both the exterior and the interior in order to make the "Gold Standard" of reprocessing systems even better.

Exterior updates:

- Color coded diagram provides visual cues to dialyzer orientation.
- Larger lettering provides a more defined front control panel.
- Line clamp for holding venous outlet line when not in use.

Interior updates:

- A header integrity test to verify that the header is on securely with the "O" ring in place.
- Limits the number of volume fail retests to two.
- Incorporates a separate cycle for collecting water samples.
- Adds a dedicated and more aggressive Formula 409® NQF cycle for cleaning heavily deposited systems.

Updates will be incorporated in new systems and can be purchased as an update package for existing Renatron II 100 Series stations.

All New - On Demand™ Autodilution System

"It doesn't get any easier" was the quote from the first clinic to use the On Demand Autodilution System. The On Demand System was developed in response to a need for a safe, accurate and labor-saving alternative to manual preparation of 1% Renalin® 100 Cold Sterilant solution. A connection to a water supply that meets the AAMI requirements of RD62 and a container of Renalin 100 are all that is required. With the touch of one finger, the On Demand Autodilution System proportions Renalin 100 Cold Sterilant and dispenses a continuous supply of 1% Renalin 100 solution. With no electrical hookups and no electronic systems, the On Demand System is an easy-to-install device and can be used within minutes.

Patient Safety: Consistent preparation of 1% Renalin 100 solution.

Staff Safety: 1% Renalin solution is prepared without staff exposure to the concentrated sterilant.

Accuracy and Validation: Validation studies of the patented design demonstrate consistent and accurate performance.

Labor Savings: The On Demand System can save hundreds of hours per year spent in the manual preparation of 1% Renalin solution.

For additional information about the On Demand Autodilution System or the Renatron II 100 Series updates, contact your Minntech Renal Systems Area Manager. For a list of Area Managers, check the Minntech website at ww.minntech.com/renal or call 866-422-7388.


On Demand™ Autodilution System

Calendar of Events

October/ November 2007

ANNA's Fall Meeting (www.annanurse.org)
October 20-22, 2007
San Francisco, CA

American Society of Nephrology (ASN) Renal Week 2007 (www.asn-online.org)
October 31-
November 5, 2007
San Francisco, CA

February 2008

National Donor Day (www.organdonor.gov/get_involved/national-donorday.htm)
February 14, 2008

2008 CMS/Forum of ESRD Networks' Annual Meeting (www.esrdnetworks.org/index.htm)
February 23-March 1, 2008
Baltimore, MD

American Health Quality Association (AHQA) Annual Meeting (www.ahqa.org)
February 25-29, 2008
San Francisco, CA

March 2008

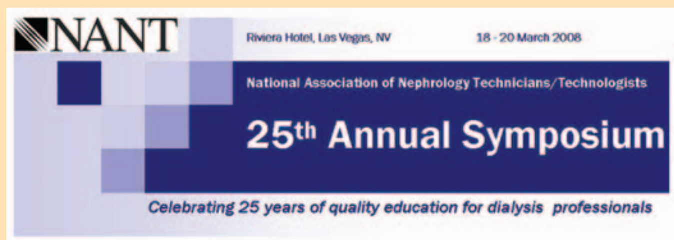
National Association of Nephrology Technicians/Technologists (NANT) 25th Annual Training Symposium, (www.nant.biz)
March 18-20, 2008
Las Vegas, NV

6th Winter World Transplant Games 2008
March 26-31, 2008
Rovaniemi, Finland

April 2008

National Kidney Foundation (NKF) 2008 Spring Clinical Nephrology Meetings (www.kidney.org)
April 2-6, 2008
Dallas, TX

ANNA 39th National Symposium (www.annanurse.org)
April 27-30, 2008
Philadelphia, PA



MINNTECH®
renal systems

Minntech Corporation
14605 28th Avenue North
Minneapolis, Minnesota 55447-4822 USA
Telephone: (763) 553-3300
Fax: (763) 553-3387