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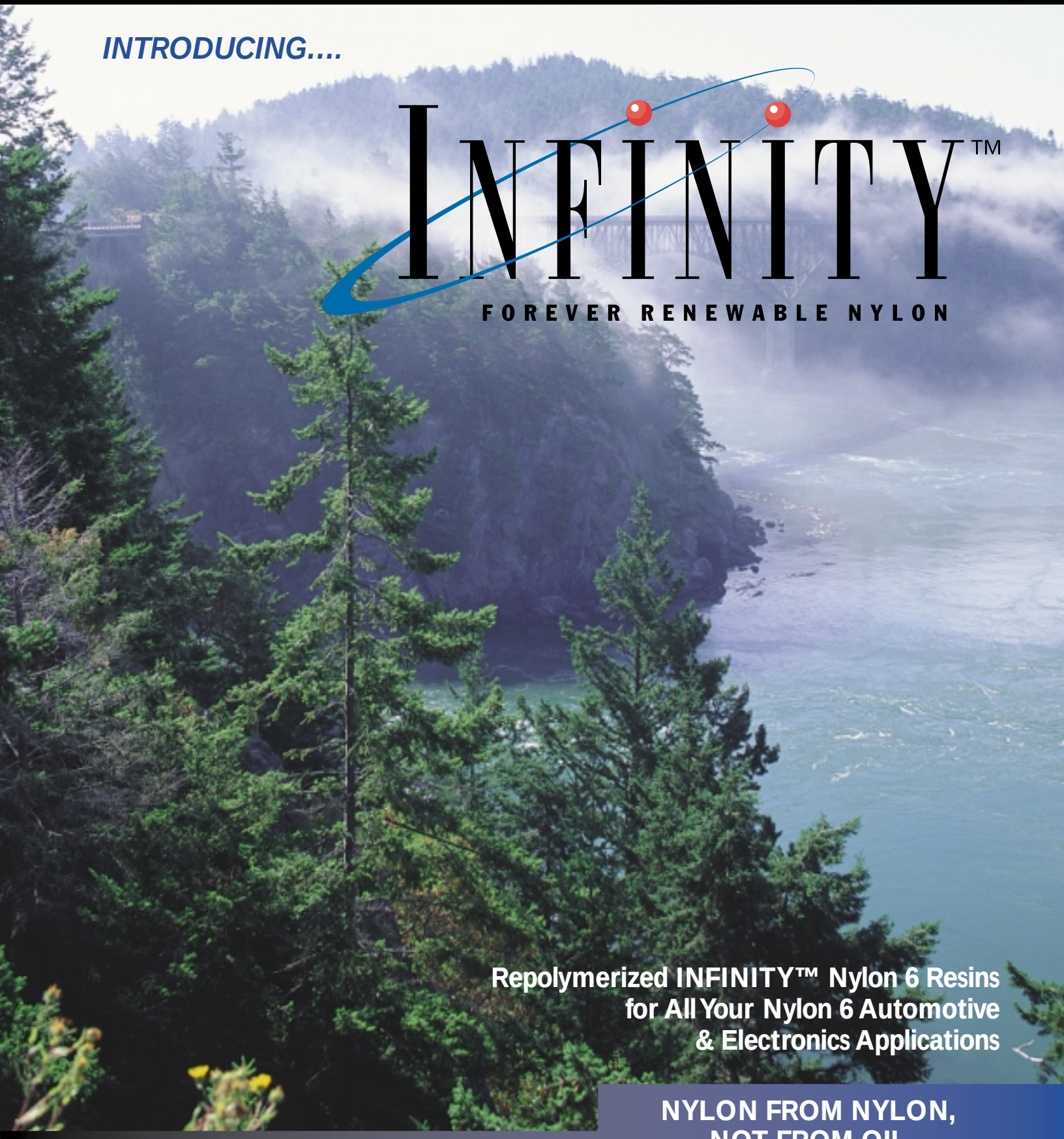
INTRODUCING....



INFINITY™

FOREVER RENEWABLE NYLON

Repolymerized INFINITY™ Nylon 6 Resins for All Your Nylon 6 Automotive & Electronics Applications

NYLON FROM NYLON, NOT FROM OIL

AlliedSignal

Now You can be Green without Sacrificing Properties

You used to have to make a choice: be Green and buy recycled polymers or engineer lean and use virgin resin. In those days, "recycled" resin meant at least some loss of properties, and that was an unacceptable situation for critical and safety-related applications. Hence, the maximum allowable recycled content in most applications was small and truly Green (100% recycled) applications were limited.

But now that's all changed! Revolutionary patented technology from AlliedSignal has led to the first commercially viable, repoly engineering thermoplastic: INFINITY™ nylon 6 resin. By using repolymerization instead of melt reprocessing, we can overcome the previous limitation of property degradation in recycled thermoplastic resins. Instead, we rebuild the polymer, restoring all its original properties.

Not only are INFINITY™ resins recycled, but they are 100% recyclable too, so they truly are *Forever Renewable Nylon.*

A New Era in Recycled Polymers

INFINITY™ nylon 6 polymers represent the next generation in recycled materials. That's because they're chemically not mechanically recycled, so the full spectrum of physical, mechanical, and aesthetic properties of virgin nylon 6 are retained. Better still, they contain post-consumer recycled (PCR) content from used commercial carpeting and molded parts that otherwise would be destined for the landfill. This helps promote and financially justify closed-loop recycling programs – a very important point indeed.

Part of the reason that previous engineering thermoplastics recycling programs have had limited success has been the difficulty in setting up a collection, sorting, and recycling infrastructure that was financially attractive to the entire supply chain. Additional challenges have included finding an acceptable method for sorting various polymers and the availability of a cost-effective supply stream of the materials. Fortunately, we answered all these challenges as we carefully designed a system to produce INFINITY™ resins.

First, we began by working within an existing collection and recycling infrastructure – carpet retailers, installers, and recyclers – so we weren't limited by the time and expense it takes to build such a system from scratch.

Second, we bring value to all members of the supply chain. We pay carpet collectors to gather, sort, and bale worn carpet that would otherwise be landfilled. And our collectors are paid to bring the worn carpet to our depolymerization plant. Since our plant can consume up to 200-million lb of carpet or molded parts annually, the high volume provides attractive pricing for all members, creating a win-win situation. We also have a provision to take back used nylon 6 auto parts – even those with paint on them.

Third, we make it easy for carpet collectors to identify nylon 6 carpet. We provide them with a portable, and held near-infrared scanner that helps them quickly scan and sort the nylon 6 carpet from carpet made from nylon 6, 6 and polyester.

Finally, AlliedSignal benefits from a cost-effective supply of feedstock that justifies the expense of building and running a state-of-the-art depolymerization plant. Our customers benefit by having a ready supply of recycled nylon 6 polymer that's every bit as good as our virgin resin. And our planet benefits by cleaner air, water, and land.

Attribute	Closed-Loop Recycling via Repolymerization	Resin Recovery via Melt Reprocessing
Color	Any Color	Black Only
Performance	Same as Virgin	Lower than Virgin
Max. Allowable Usage Content	100%	Limited (varies by Application)
Applications	All Applications served by the virgin polymer	Limited by Performance to Non-Critical

There are many performance advantages to closed-loop recycling via repolymerization as compared with conventional resin recovery of melt-reprocessed resin. However, both processes greatly benefit the environment and should be encouraged by OEMs, processors, resin suppliers, and consumers alike.

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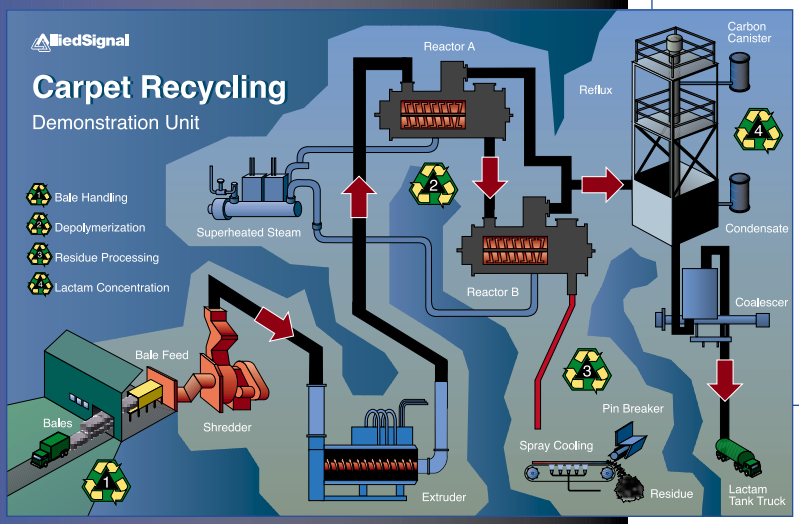
How We Do it

- New carpet is sold to a commercial building owner
- A carpet installer removes the old worn carpeting and returns it to the carpet collector
- The carpet collector sorts and bales all the returned carpeting using a hand-held infrared scanner
- A recycler picks up all the nylon 6 carpeting and takes it to the repolymerization plant
- Worn carpeting is fed into the front end of the depolymerization plant. Molded nylon 6 parts – even those with paint – can also be used.



- Super-heated steam is used to depolymerize (chemically separate) the nylon 6 from other components of the carpet, including the rubber backing
- The depolymerized nylon 6 is further processed to return it to its caprolactam feedstock, which is then filtered for high purity and shipped to our polymerization plants to make new INFINITY™ nylon 6 resin

Properties of INFINITY™ Repoly Nylon 6 resins

INFINITY™ repoly nylon 6 resins can be designed with, processed, and handled exactly the same way you'd use CAPRON® virgin nylon 6 resin. The products:

- Are tough, strong, and impact resistant
- Have a low coefficient of friction for wear applications
- Offer good abrasion resistance
- Provide high temperature resistance
- Present good, broad chemical resistance, including resistance to solvents, bases, and aromatic hydrocarbons

Further, the repoly material can be impact modified, glass- and/or mineral-reinforced, and self-colored just like virgin nylon 6. Even the excellent, high-gloss, high depth-of-image (DOI) finish that characterizes CAPRON® virgin nylon resin are retained.

When processing, remember that all nylon resins are hygroscopic and should be dried prior to molding.

There should be no process or secondary-operation changes needed when switching from virgin nylon 6 to INFINITY™ repoly nylon 6 resins

Process

- Injection Molding
  - Co-injection Molding
  - TPE overmolding
  - Gas-assist injection molding
  - Structural foam molding
- Extrusion
- Blow Molding
- Thermoforming
- Rotomolding

Secondary Operations

- Fastening
  - Adhesives
  - Mechanical fasteners
  - Vibration welding
- Painting
- Plating

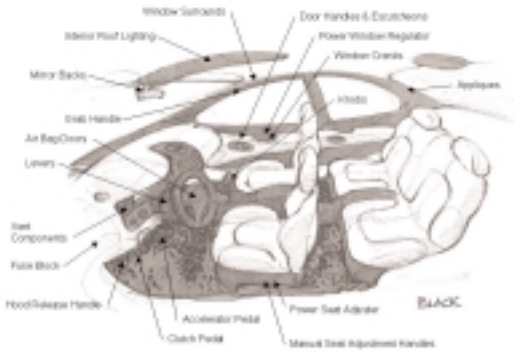
Typical Applications

Products made from INFINITY™ repoly nylon 6 resin are ideal for any application that you currently mold or could mold using virgin CAPRON® nylon 6 resin. Since there is no loss of properties, INFINITY™ repoly nylon 6 resins offer the opportunity for "car part to car part recycling."

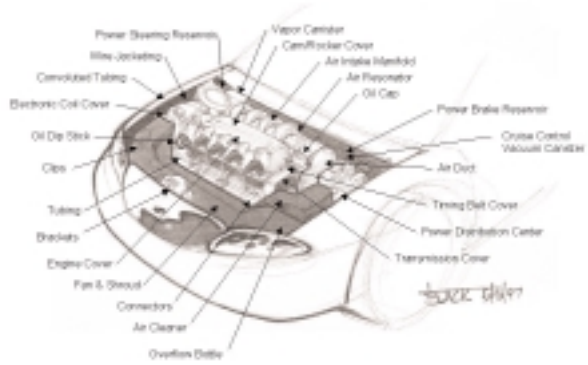
Typical automotive and electronic applications include:

- Air-intake manifolds
- Carpeting
- Carbon-canister housings
- Connectors and other discrete electronics devices
- Door handles (interior, exterior, and escutcheon)
- Engine covers
- Engine-driven fan blades
- Exterior mirror housings and scalps (sail panels)
- Luggage racks
- Multifunctional switches for interior handles
- Resonators
- Seatbelt restraint components
- Vacuum reservoirs and tubing
- Various clips, fasteners, buttons, and knobs
- Wire and cable insulation and jacketing

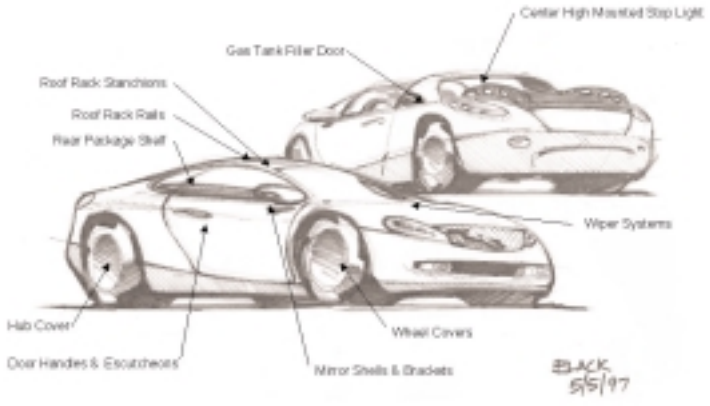
Interior Automotive Uses



Underhood Automotive Uses



Exterior Automotive Uses



Our Credentials Speak for Themselves

For over 3 decades, AlliedSignal Plastics – one of the world's leading suppliers of nylon 6 resin for automotive and electronic components – has been a recognized leader in the production of recycled and recyclable plastics. Not only do we offer and sell more grades of recycled engineering thermoplastics than any other supplier, but we also assist you with design for disassembly and recyclability.

Other long-established recycled thermoplastics from AlliedSignal Plastics are favorites with our customers for their value in less demanding environments. These products are mechanically recycled (melt reprocessed), and so do not retain 100% of the properties of their virgin counterparts.

- NYPEL® post-industrial recycled nylon 6 resin – the feedstock for this family of products comes from our own in-plant scrap as well as post-consumer products. It is only available in black and has a limited range of compounded offerings.
- PETRA® post-consumer recycled PET resin – the feedstock for this product comes from community-based soda-bottle recycling efforts that remove over 75-million PET bottles from the North American waste stream each year. The material is suitable for a range of applications including speaker brackets, engine covers, and ignition-coil housings.

Both product lines are already widely used in automotive and electronic components where temperature and chemical resistance, impact and mechanical strength, and consumer aesthetics are required. These materials, however, are not suitable for high-end engineering applications.

Our efforts on behalf of the environment have not gone unnoticed. AlliedSignal Plastics' environmental awards include The Keep America Beautiful *Vision for America* Certificate of Recognition for our contributions and years of assistance in environmental recycling with Ford Motor Company. We have also been a participant in such projects as Ford's interactive, traveling E-Patrol environmental demo car/exhibit and its Environmental Media Day; in General Motor's Green Day; and in the DaimlerChrysler Earth Day event.

Chemical vs. Mechanical Recycling – Why You Should Care

Definitions:

Mechanical recycling of plastics = melt reprocessing

The plastic just changes phase (solid ➤ liquid ➤ solid), but properties can be lost on each phase change. Worse, it's not always possible to predict which properties will be affected and how much of those properties will be lost.

Chemical recycling of plastics = repolymerizing

The plastic is first depolymerized back to its feedstock, then repolymerized and built into a polymer again with no measurable property loss. The repoly resin can then be further compounded with glass and/or mineral fillers, colorants, and various other additives to achieve all the excellent performance properties you've come to expect from CAPRON® nylon 6 resin and from AlliedSignal.

Chemical recycling offers the advantages of

- Delivering recycled materials with full property retention
- Diverting an estimated 200-million lb of nylon 6 carpeting and molded parts from landfills each year
- Reducing petroleum consumption and pollution by using recycled caprolactam, helping keep our air and water cleaner
- Saving an estimated 5-trillion BTUs of energy annually – enough to heat 100,000 average U.S. homes for a year
- Promoting closed-loop recycling
- Helping make nylon 6 production a sustainable and annually renewable process

Even with the best of our current technology, it's virtually impossible to distinguish between the virgin caprolactam we use to make CAPRON® nylon 6 resin and the recycled caprolactam we use to make INFINITY™ nylon 6 resin. Hence, you can be assured that no matter which resin family you choose from – CAPRON® virgin or INFINITY™ repoly resins – that your nylon 6 from AlliedSignal Plastics will be of the highest quality and consistency.

INFINITY™ repoly nylon 6 resins use feedstocks made from other nylon 6 resins, not from oil. Hence, use of these products helps support closed-loop recycling, reduce waste and energy consumption, and makes nylon 6 production a more sustainable, annually renewable process.

$$H(NH(CH_2)_5CO)_n OH$$
(Nylon 6 Polymer)+
$$H_2N(CH_2)_5COOH$$
(Caprolactam)

Polymerization ⟷ Depolymerization

$$H(NH(CH_2)_5CO)_{n+1}OH + H_2O$$

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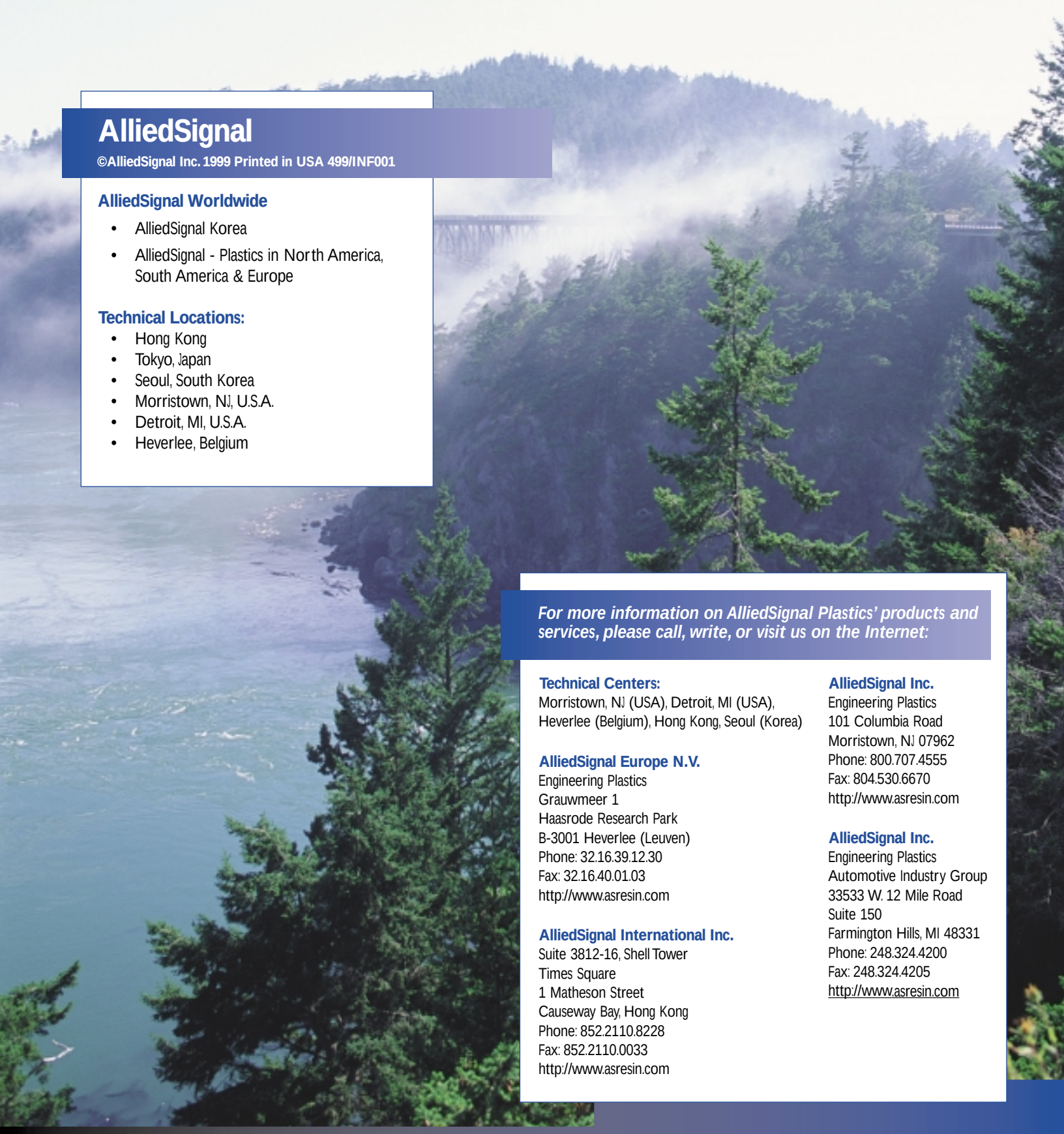
AlliedSignal Worldwide

- AlliedSignal Korea
- AlliedSignal - Plastics in North America, South America & Europe

Technical Locations:

- Hong Kong
- Tokyo, Japan
- Seoul, South Korea
- Morristown, NJ, U.S.A.
- Detroit, MI, U.S.A.
- Heverlee, Belgium



For more information on AlliedSignal Plastics' products and services, please call, write, or visit us on the Internet:

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