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The Nanotechnology Consumer Products Inventory

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Introduction

After more than twenty years of basic and applied research, nanotechnologies are gaining in commercial use. Nanoscale materials now are in electronic, cosmetics, automotive and medical products. But it has been difficult to find out how many "nano" consumer products are on the market and which merchandise could be called "nano."

This is the first publicly available on-line inventory of nanotechnology-based consumer products. The inventory is an essential resource for consumers, citizens, policymakers, and others who are interested in learning about how nanotechnology is entering the marketplace. It is meant to be international and expanding. Additions to the inventory will be made periodically, as new information is received.¹

While not comprehensive, this inventory gives the public the best available look at the 200+ nanotechnology-based consumer products currently on the market. Prior to this inventory, the figure most often cited by the U.S. government was that approximately 80 consumer products using nanotechnology or containing nanomaterials were being sold.

Methodology

Beginning in 2005, the Project began compiling products and materials using or containing nanotechnology from around the globe for inclusion in the consumer inventory. Entry to the list is based primarily on online, English language information provided by the product manufacturers. It does not include nanotechnology consumer products which companies have not identified as such. Any statements, claims and views expressed by a manufacturer or third-party contained in this inventory are solely those of the party making the statement or claim.

The information contained within the inventory is solely based on information that can be readily found on the internet; non-internet based sources have not been used. By taking this approach, all entries can be validated by anyone with internet access.

Products have been identified for inclusion in the inventory following systematic web-based searches. These have ranged from exploratory searches, through searches on specific categories of goods, to following up leads from multiple sources (including media articles). Information from relevant listservs and Really Simple Syndication (RSS) feeds was also used.

Products in this inventory satisfy three criteria:

- They can be readily purchased by consumers, and
- They are identified as nano-based by the manufacturer OR another source, and
- The nano-based claims for the product appear reasonable.

In every instance, we have tried to identify specific products from specific producers. However, since nanotechnology has broad applications in a variety of fields, we have included a number of "generic" products that you can find in many places on the market such as computer processor chips (identified in the inventory by the **Generic** icon). In

¹ Users are encouraged to submit new and updated information to nano@whisoncenter.org.

some cases, companies offer several similar nanotechnology-based products and product lines. To reduce redundancy, we have just included a few samples in this inventory and hope that they will provide an initial baseline for understanding how nanotechnology is being commercialized.

We have made no attempt to verify manufacturer claims about the use of nanotechnology in any products, nor have we conducted any independent testing of the products.

This is a dynamic inventory, and will be updated on a regular basis.

Summary

As of March 8, 2006, the nanotechnology consumer products inventory contained 212 products or product lines. For each entry, information is provided on:

- Product name
- Company, manufacturer or supplier
- Country of origin
- Category and subcategory
- Product picture
- Product description
- Hyperlink to product web page
- Date of update

Products are grouped according to eight main categories (Figure 1) that are loosely based on publicly available consumer product classification systems. These include:

- **Appliances** (Heating, cooling and air; large kitchen appliances; laundry and clothing care)
- **Automotive** (Exterior; maintenance and accessories)
- **Goods for Children** (Basics; toys and games)
- **Electronics and Computers** (Audio; cameras and film; computer hardware; display; mobile devices and communications; television; video)
- **Food and Beverage** (Cooking; food; storage; supplements)
- **Health and Fitness** (Clothing; cosmetics; filtration; personal care; sporting goods; sunscreen)
- **Home and Garden** (leaning; construction materials; home furnishings; luxury; paint)
- **Cross-Cutting** (Coatings)

As new products are entered, new categories and sub-categories will be added as needed.

Products by Category

The total number of products in the inventory is 212. Products with relevance to more than one category have been accounted for multiple times in Figure 1. The largest main category is *Health and Fitness*, with a total of 125 products. This includes products like cosmetics and sunscreens. Associated with each category are a number of appropriate sub-categories that allow for further organization of the products. For example, *Paint* is a sub-category under *Home and Garden*, while *Display* is a sub-category under *Electronics and Computers*. The *Cross-Cutting* category was included as a grouping of products that are multi-functional. Currently, the only sub-category under *Cross-Cutting* is *Coatings*.

In addition, 45 products have a “generic” designation, indicating that they are commercial technologies that will be used in, or are currently appearing in, a range of consumer products.

Figure 2 illustrates the sub-categories associated with the largest main category, *Health and Fitness*. It includes *Clothing* (34 products), *Sporting Goods* (33), *Cosmetics* (31), *Personal Care* (23), *Sunscreen* (8), and *Filtration* (6). Again, products with relevance to multiple categories have been accounted for multiple times. The *Clothing* sub-category is the largest in the inventory.

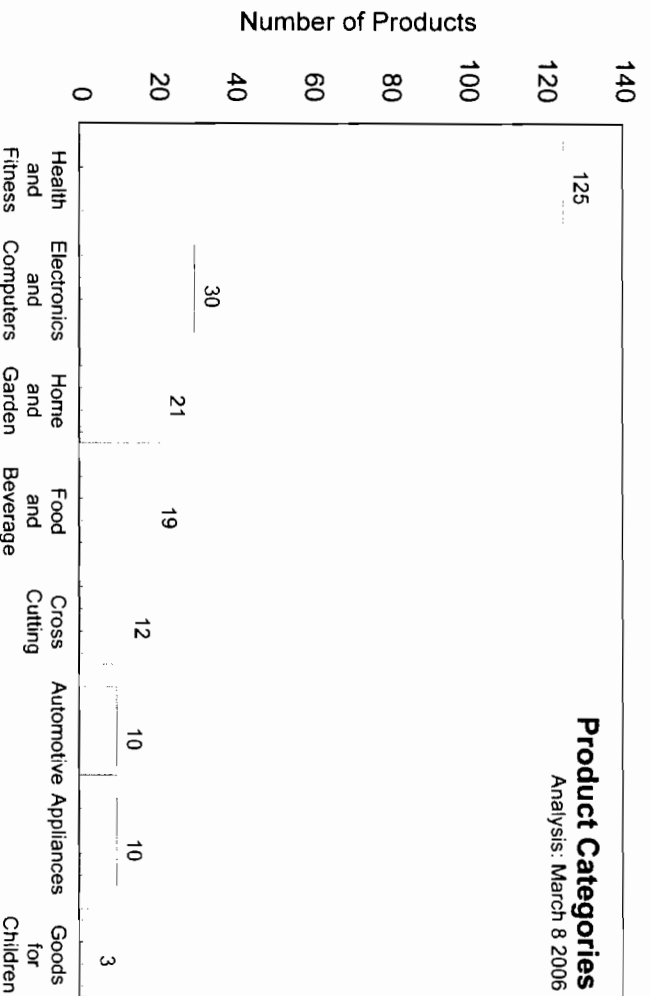
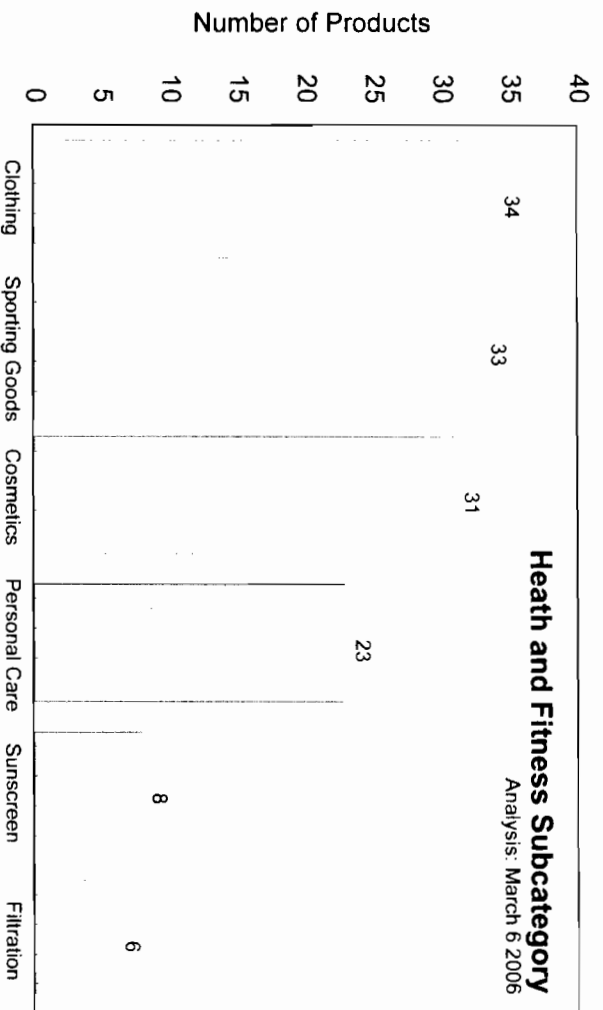


Figure 1. Number of products, according to category. Because some products are grouped into multiple categories, the total number of products in this chart exceeds 212.

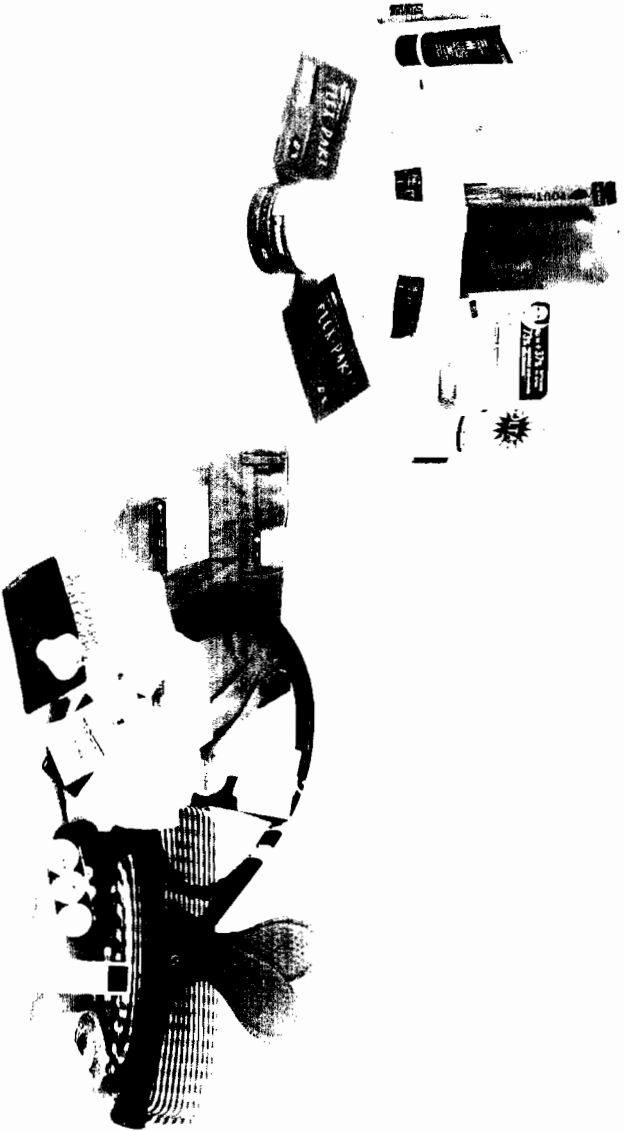


Nanotechnology Consumer Products Inventory

www.nanotechproject.org/consumers/products/

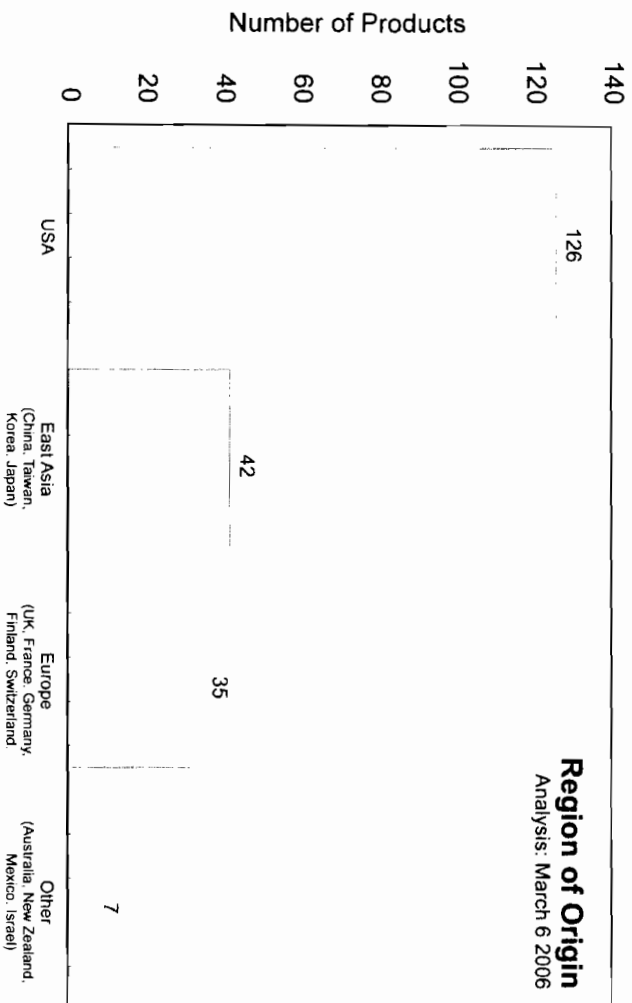
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Figure 2. Number of products per sub-category within the category *Health and Fitness*



Regions of Origin

The inventory includes products from 15 different countries, including the United States, Korea, Japan, United Kingdom, Germany, France, China, Taiwan, Australia, Israel, Finland, Mexico, Switzerland, New Zealand and Sweden. Figure 3 illustrates the breakdown of products by region and indicates that companies based in the United States have the most products, with a total of 126, followed by companies in Asia (42), Europe (35), and elsewhere around the world (7). Two products have not been included in this figure because they are headquartered in multiple countries.



Nanotechnology Consumer Products Inventory www.nanotechproject.org/consumerproducts/

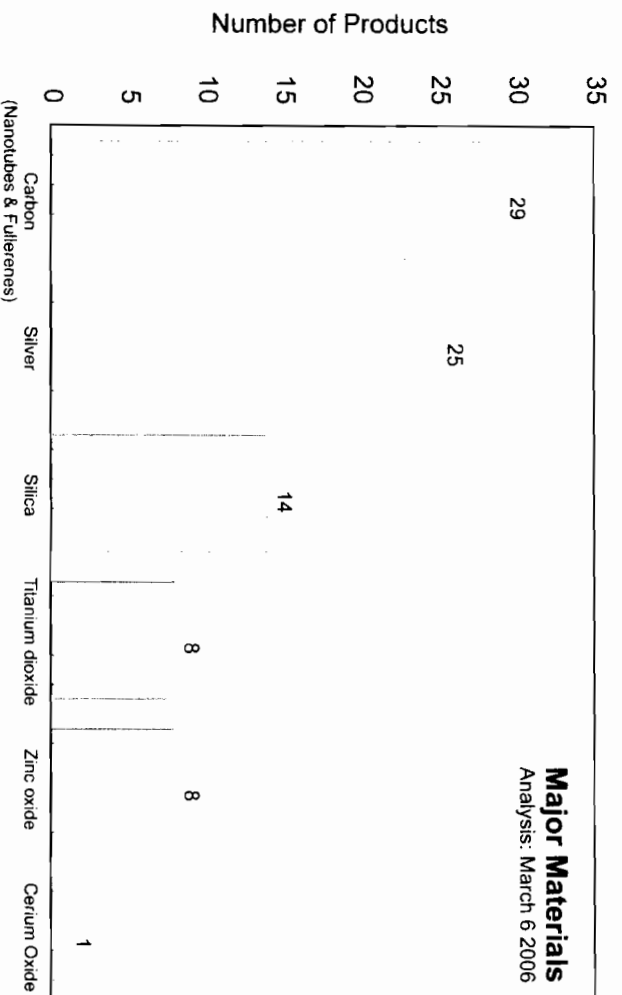
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Figure 3. Number of products per region.



Major Types of Engineered Nanomaterials Used

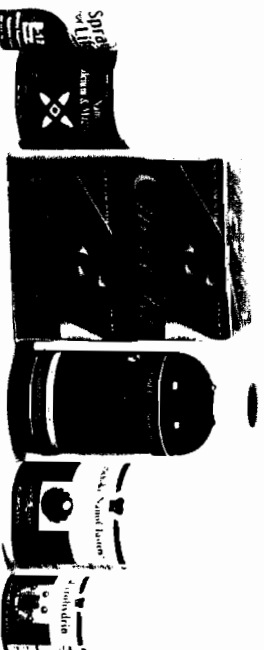
As Figure 4 indicates, there is a small set of materials explicitly referenced in nanotechnology consumer products. The most common material mentioned in the product descriptions is carbon (29 products), which includes fullerenes and nanotubes. Silver is the second most referenced (25 products), followed by silica (14), titanium dioxide (8), zinc oxide (8), and cerium oxide (1). By our estimate, there are also a total of 15 products in the inventory, including food and dietary supplements, that are ingested into the body and a total of 56 products, including cosmetics, sunscreens, and select personal care products, that are applied directly on the skin.



Nanotechnology Consumer Products Inventory www.nanotechnology.org/cpn/products/

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Figure 4. Numbers of products associated with specific materials.



Using the Inventory

Browse

All products in the inventory can be viewed by selecting "Browse". Ten products at a time are shown: use Next Page and Previous Page to move forward and backward through the inventory.

Simple Search

To carry out a simple search, enter a word or words in the search box, and select Search. All products are returned that contain the entered words as part of the product name, product description, category, sub-category, company name or country of origin.

Advanced Search

To carry out a more advanced search, select Advanced Search. This takes you to a page which allows you to search for specific key words within different fields (product name, category, sub-category, product description, company name or country of origin).

Further Information

Clicking on the product name in any list of products will take you to a summary page displaying more detailed information. Once on this page, clicking again on the product name will take you to the manufacturer's web site.

Home

Clicking on the inventory title or "home" link at any point will return to the inventory home page.

"Generic" Generic

These items aren't typically available directly as consumer products, but may be found in many different products.

Nanotechnology 101

Nanotechnology is the art and science of manipulating matter at the nanoscale (down to 1/100,000 the width of a human hair) to create new and unique materials and products. The opportunities to do things differently with nanotechnology have enormous potential to change society. An estimated global research and development investment of nearly \$9 billion per year is anticipated to lead to new medical treatments and tools; more efficient energy production, storage and transmission; better access to clean water; more effective pollution reduction and prevention; and stronger, lighter materials. And these are just a few of the more significant ways in which people are discussing using the technology.

For more information on nanotechnology, check out the following websites:

Myths and realities of nanotech (BBC):

<http://news.bbc.co.uk/1/hi/sci/tech/3920685.stm>

Guide to Nanotech Future (BBC):

http://news.bbc.co.uk/1/shared/spl/hi/pop_ups/05/sci_nat_nanotechnology_builing_the_future_from_the_bottom_up/html/1.stm

Big Picture on nanoscience (Wellcome Trust):

<http://www.wellcome.ac.uk/node5954.html>

Nanotechnology: Small science, big deal (Science Museum):

www.sciencemuseum.org.uk/antenna/nano/

Woodrow Wilson Center Project on Emerging Nanotechnologies:

www.nanotechproject.org

U.S. Nanotechnology Initiative:

www.nano.gov



Nanomaterials



Nanotechnology



Particle Bioprocessing



Ultra Fine Materials



Dye Dispersion



Patents for License



Trade Shows



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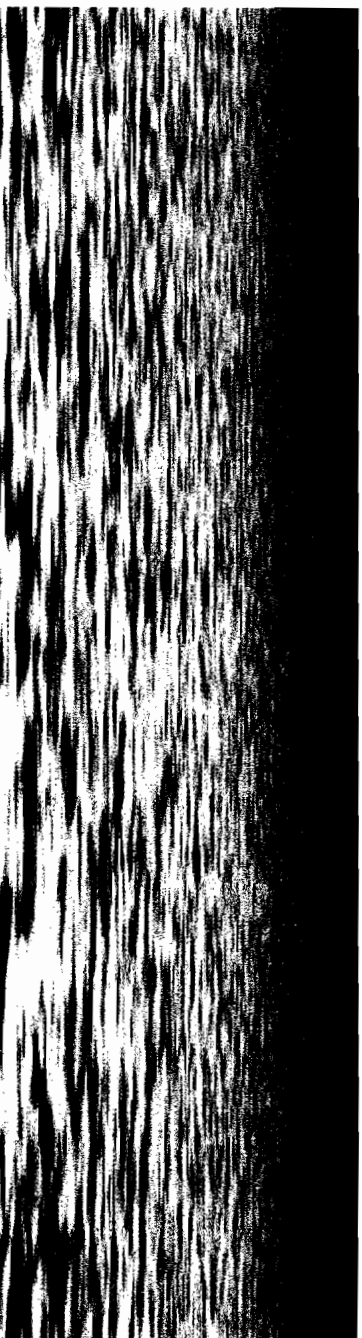
MicroPowder Solutions, LLC is a leading provider of nanomaterials and nanotechnology solutions. Our products are used in a wide range of applications, including electronics, healthcare, and environmental remediation. We offer a variety of nanomaterials, including carbon nanotubes, quantum dots, and nanofibers. Our nanotechnology solutions include nanofiltration, nanosensors, and nanomedicine. We are committed to providing high-quality products and services to our customers. For more information, please contact us at info@micropowdersolutions.com or visit our website at www.micropowdersolutions.com.

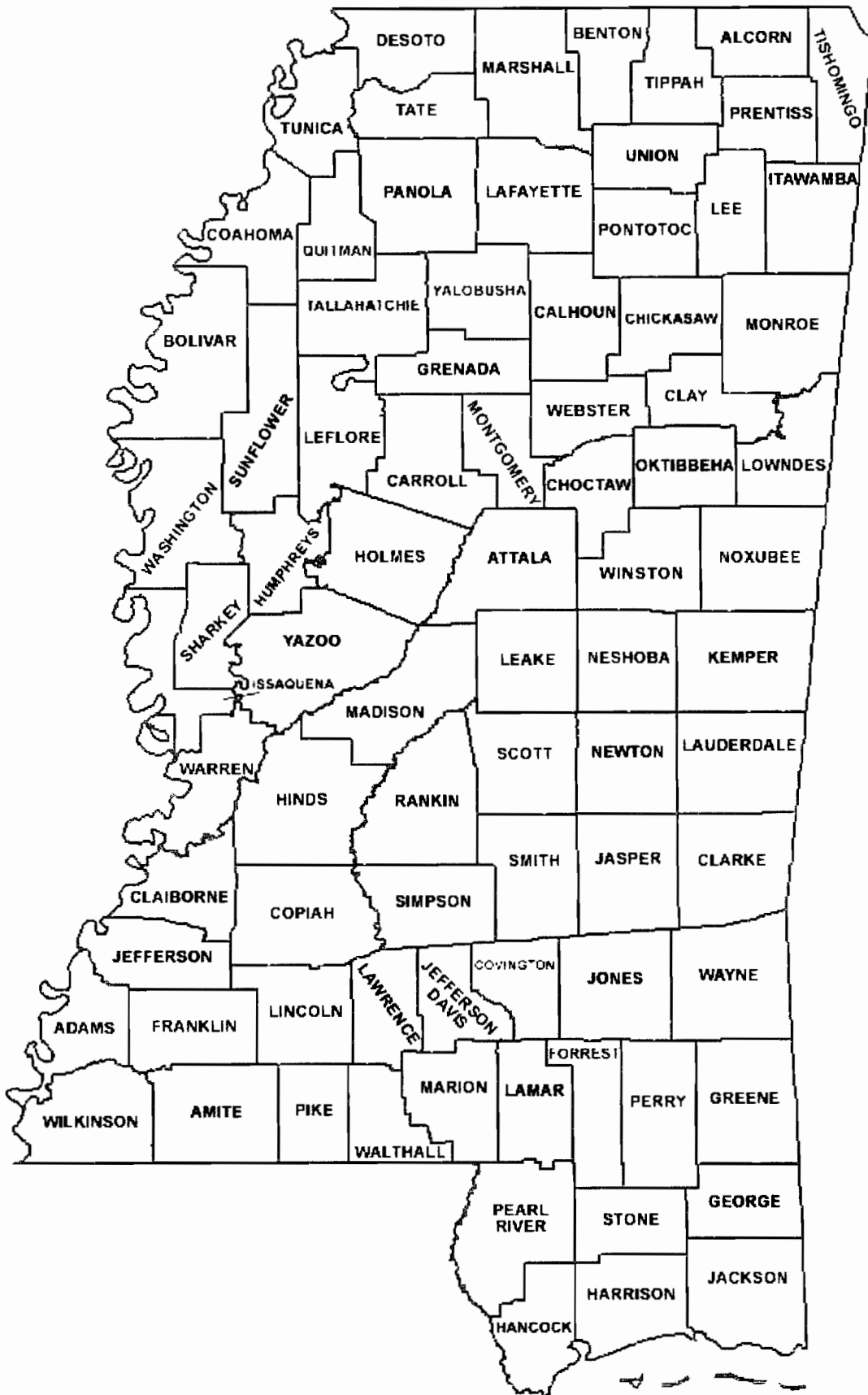
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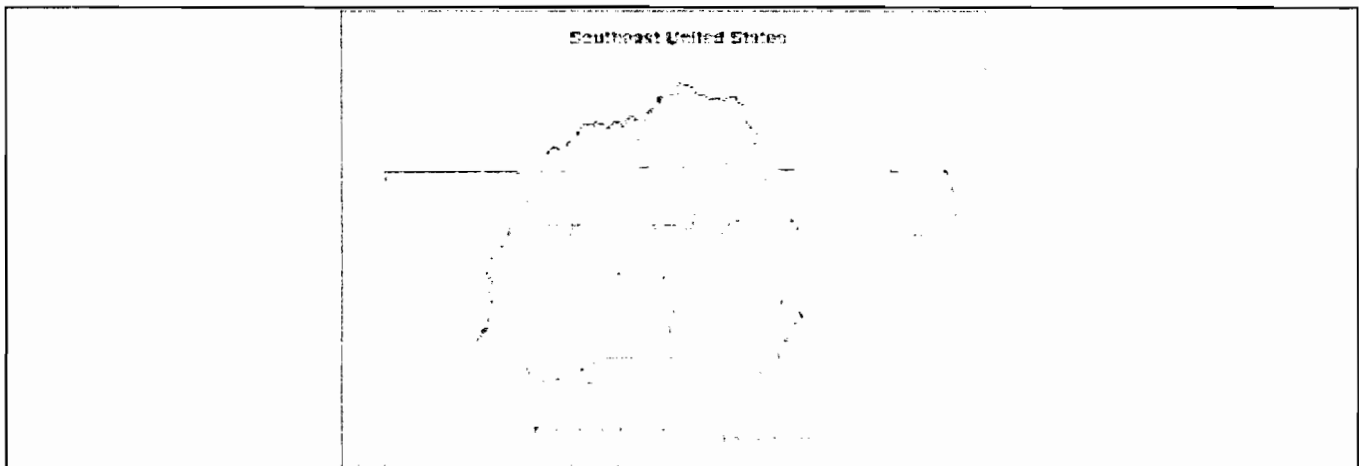




Digital-topo-maps

Regional Summary

Regional Summary



Tishomingo County is located in the northeast corner of Mississippi adjacent to Alabama on the east and Tennessee on the north. The county is located approximately 90 minutes (driving time) east of Memphis, Tennessee, 60 minutes west of Huntsville, Alabama, 30 minutes west of Florence-Muscle Shoals-Sheffield, Alabama, 60 minutes northeast of Tupelo, Mississippi, and 60 minutes southeast of Jackson, Tennessee. Tishomingo County is located at the juncture of water, rail, and highway transportation which makes the locality one of the best manufacturing and distribution sites in the Southeastern United States.

The labor force commuting area consists of an eight county area in Mississippi, Alabama, and Tennessee with a population over 300,000 and a civilian labor force of 143,000. Manufacturing employment in the region is 36,579

The county has a five member board of supervisors while the municipalities in the county have a mayor/alderman system of government. The county contains six municipalities. Belmont and Golden have a trade area population of 18,514; Burnsville has a trade area population of 9,120; Iuka has a trade area population of 27,634; and Tishomingo and Paden have a trade area population of 4,260. The county, all six municipalities, a port authority, the local electric power association, and the private sector coordinate and cooperate on economic development projects via the Tishomingo County Development Foundation, a non-profit local economic and community development organization.

Job Classification	Average Hourly Wage Rate
Assembler	\$11.82
Blow mold machine operator	\$ 9.70
Chemical operators	\$16.04
Clerical worker	\$12.53
Clerk, production	\$11.97
Clerk, purchasing	\$13.00
Clerk, stockroom	\$14.86
CNC Technician	\$12.59
Crane operator	\$12.08
Cushion builders	\$10.10
Cushion finishers	\$ 9.44
Customer service	\$10.76
Cutter/saw operator	\$10.85
Drafter	\$10.16
Drill operator	\$10.26
Electrician	\$19.92
Engineer	\$17.36
Extruder operator	\$16.70
Finisher	\$10.06
Fork lift operator	\$11.66
Frame builders	\$ 8.78
Grinder operator	\$13.75
Heavy equipment operator	\$10.98
Injection mold operator	\$ 8.78
Inspector	\$13.63
Janitor	\$10.32
Kiln operator	\$11.75
Lab technician	\$15.72
Lead/foreperson	\$14.87
Lumber handlers	\$ 8.27
Machine operator A (metal)	\$11.71
Machine operator B (metal)	\$15.99
Machine operator C (metal)	\$13.40
Machine setup	\$13.05
Machinist	\$15.42
Maintenance worker	\$15.59
Mechanic	\$18.93
Mill operator	\$15.95
Millwright	\$16.80
Painter	\$13.73
Quality control	\$15.58

Screw machine operator	\$14.47
Semiskilled worker (NOC)	\$ 9.60
Sheet metal worker	\$ 8.45
Ship/load/materials worker	\$11.40
Skilled worker (NOC)	\$11.07
Supervisor	\$11.86
Tool & die maker	\$16.62
Trucker	\$15.23
Upholsterer	\$12.36
Warehouse/storekeeper	\$12.81
Welder, production	\$12.00
Woodworking	\$ 8.56

Source: North Mississippi Industrial Development Association Wage Survey, 2004, Alcorn, Itawamba, Prentiss, Tippah, and Tishomingo Counties

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The TENNESSEE-TOMBIGBEE WATERWAY



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Map of Locks and Dams

THE TENNESSEE-TOMBIGBEE WATERWAY
America's New Transportation Artery



America's New Transportation Artery

US Army Corps of Engineers Map of the Tenn-Tom Waterway
(also available as part of the *Touring the Tenn-Tom Waterway* Brochure
-click here to access request form)

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Tracy W. Lusk

Consulting Geological Engineer

Oxford, Mississippi

August 9, 1984

Mr. Edward E. Miller
700 Hillsboro Road
Franklin, Tennessee 37064

Dear Mr. Miller:

In 1970, I conducted an exploration program in Tishomingo County, Mississippi, for limestone for use as aggregate in concrete and asphalt. This study consisted of the usual procedures involved in an economic mineral appraisal - study of area outcrops, type of exposed material, topographic conditions and core drilling. It was also known to have been explored previously by the recipient of this letter.

The core drilling in 1970 consisted of coring five (5) holes. The spacing and location of each hole was critically considered in order to best cover the acreage. These holes ranged in depth from 75 feet to 230 feet. Each hole was continuously cored and all were in limestone at total depth. The core from the 230-foot hole was tested by Pittsburg Testing Laboratory, Nashville, Tennessee. The tests were based on the specifications of the Mississippi State Highway Department, which meets the standards of the Bureau of Public Roads. The test results were well within the specification limits.

Chemical analyses were also run on the cores to determine the calcium content for use as agricultural lime, another viable product. These tests were conducted by Pittsburg Testing and the Mississippi State Chemical Laboratory. The calcium content proved to be very good.

In 1971, Medusa Cement Company drilled and cored thirty-three (33) additional holes on the limestone deposit which included several properties not previously explored by me. One of these holes was cored to a depth of 301.8 feet and was still in limestone at total depth. This drilling provided factual information that proved a much larger acreage should be included in the deposit estimate.

The additional drill and core hole information expanded the proven acreage to a minimum of 216 acres. I consider this acreage to be very conservative. The deposit could well cover in excess of 300 acres. Also, the deeper coring (301.8 feet) proves a greater thickness. However, to stay on the conservative side the following estimates are based on 216 acres and a thickness of 250 feet.

Summation of Reserves

Reid property.....	44,700,000 tons
Gant property.....	43,000,000 tons
Hiawasse property.....	29,000,000 tons
Sanders property.....	69,000,000 tons
Total.....	185,700,000 tons

Should the additional acreage (300+ acres) be proven, a reasonable assumption, the in-place limestone would be in excess of 250,000,000 tons. At \$0.05 per ton royalty the ultimate value is \$12,500,000 and your two thirds (2/3) interest amounts to \$8,333,333.

In January 1941, the Mellen & Gear No. 1 E.K.Wood well for oil and gas (D & A) was drilled in the southeast corner of Section 21, Township 4 South, Range 11 East, Tishomingo County, Mississippi. The total depth of the well was 1845 ft. The top of the limestone was encountered at 70 ft. and continued in limestone to total depth, a thickness of 1775 ft. Such a thickness would extend the mining time by many years as the tonnage estimate would jump to more than 1 billion tons.

I sincerely hope this provides the information that you need. Should there be a need for further assistance, please let me know.

Respectfully submitted,



Tracy W. Lusk

nr

Tracy W. Lusk
Consulting Geological Engineer
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Oxford, Mississippi 38655

Phone
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October 8, 1990

Mr. Edward E. Miller
700 Hillsboro Road
Franklin, Tennessee 37064

Dear Mr. Miller:

A brief review of previous studies conducted for limestone in Tishomingo County, Mississippi, is in order to better evaluate contiguous properties. In 1970, I conducted an exploration program in the southeast corner of Section 21 and the southwest corner of Section 22, T.4S., R.11E. The program was designed to evaluate the economic feasibility of utilizing the limestone as an aggregate in concrete and asphalt. The most significant phase of the program was the core drilling, which consisted of coring five (5) holes. The holes were located to best cover the acreage and ranged in depth from 75 feet to 230 feet. Each hole was tested by Pittsburg Testing Laboratory, Nashville, Tennessee. The tests were based on specifications of the Mississippi State Highway Department, which meets the standards of the U. S. Bureau of Public Roads. The tests proved to be within the specification limits.

In 1971, Medusa Cement Company drilled and cored thirty-three (33) additional holes on the previously cored property as well as adjacent lands. One of their holes was cored to a depth of 301.8 feet and was still in limestone at total depth. This drilling proved a much larger acreage (216 acres). A conservative estimate of the proven reserves was 185,700,000 tons.

These exploration studies soon led to mining the limestone which ~~h~~ was continued.

In 1978, eighty-nine (89) holes were drilled on the 214 acres in Sections 15, 16, 24, T.4S., R.11E., Tishomingo County, Mississippi, in which you own the mineral rights. These holes proved the 214 acres to be underlain with limestone. Using the same conservative thickness of 250 feet, the in-place limestone is estimated to be 183,980,000 tons.

Also, the overburden consists of sand and gravel. Tests have indicated the sand to be suitable for use as fine aggregate in concrete and asphalt, a much needed product in this area. I have personally searched for a quality sand in Tishomingo County with little success.

October 8, 1990
Page 2

Of considerable importance is the fact that this property fronts on the main road. This definitely enhances the value as transportation is a major cost in a bulk commodity.

Inasmuch as your mineral deed is subject to only a \$0.05 per ton royalty, your value in the deposit is a sizable sum. At a very conservative net royalty of \$0.15 the value is in excess of \$29,500,000. However, I would expect the net royalty to be more on today's market.

A well for oil and gas was drilled in 1941, in Section 21, T.4S, 11E. This well encountered 1775 feet of limestone and was in limestone at total depth. With this being the only aggregate grade limestone deposit in the state of Mississippi, its value is still further enhanced.

Hopefully this provides you the needed information. If I can be of further assistance, please let me know.

Respectfully submitted,


Tracy W. Lusk
Consulting Geological Engineer

TWL/11

Enclosure

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