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Agency

Office of Pollution
Prevention and Toxics
7408

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EPA

EPA's 33/50 Program Company Profile

Inland Steel

a subsidiary of
Inland Steel Industries, Inc.

Partnership in Prevention
Government-Industry-Community

This Company Profile is part of a series of reports being developed by EPA to highlight the accomplishments of companies participating in the 33/50 Program. The 33/50 Program is an EPA voluntary pollution reduction initiative that promotes reductions in direct environmental releases and offsite transfers of 17 high-priority toxic chemicals. The program derives its name from its overall goals — an interim goal of a 33% reduction by 1992 and an ultimate goal of a 50% reduction by 1995. The program uses 1988 Toxics Release Inventory (TRI) reporting as a baseline. In February, 1991, EPA began contacting the parent companies of TRI facilities that reported using 33/50 Program chemicals since 1988 to request their participation in the 33/50 Program. As of November, 1995, nearly 1,300 companies had elected to participate in the Program, pledging to reduce emissions of the 17 target chemicals by more than 380 million pounds by 1995. Companies set their own reduction targets, which may vary from the Program's national 33% and 50% reduction goals.

17 PRIORITY CHEMICALS TARGETED BY THE 33/50 PROGRAM

BENZENE
CADMIUM & COMPOUNDS
CARBON TETRACHLORIDE
CHLOROFORM
CHROMIUM & COMPOUNDS
CYANIDES
DICHLOROMETHANE*
LEAD & COMPOUNDS
MERCURY & COMPOUNDS
METHYL ETHYL KETONE
METHYL ISOBUTYL KETONE
NICKEL & COMPOUNDS
TETRACHLOROETHYLENE
TOLUENE
1,1,1-TRICHLOROETHANE
TRICHLOROETHYLENE
XYLENES

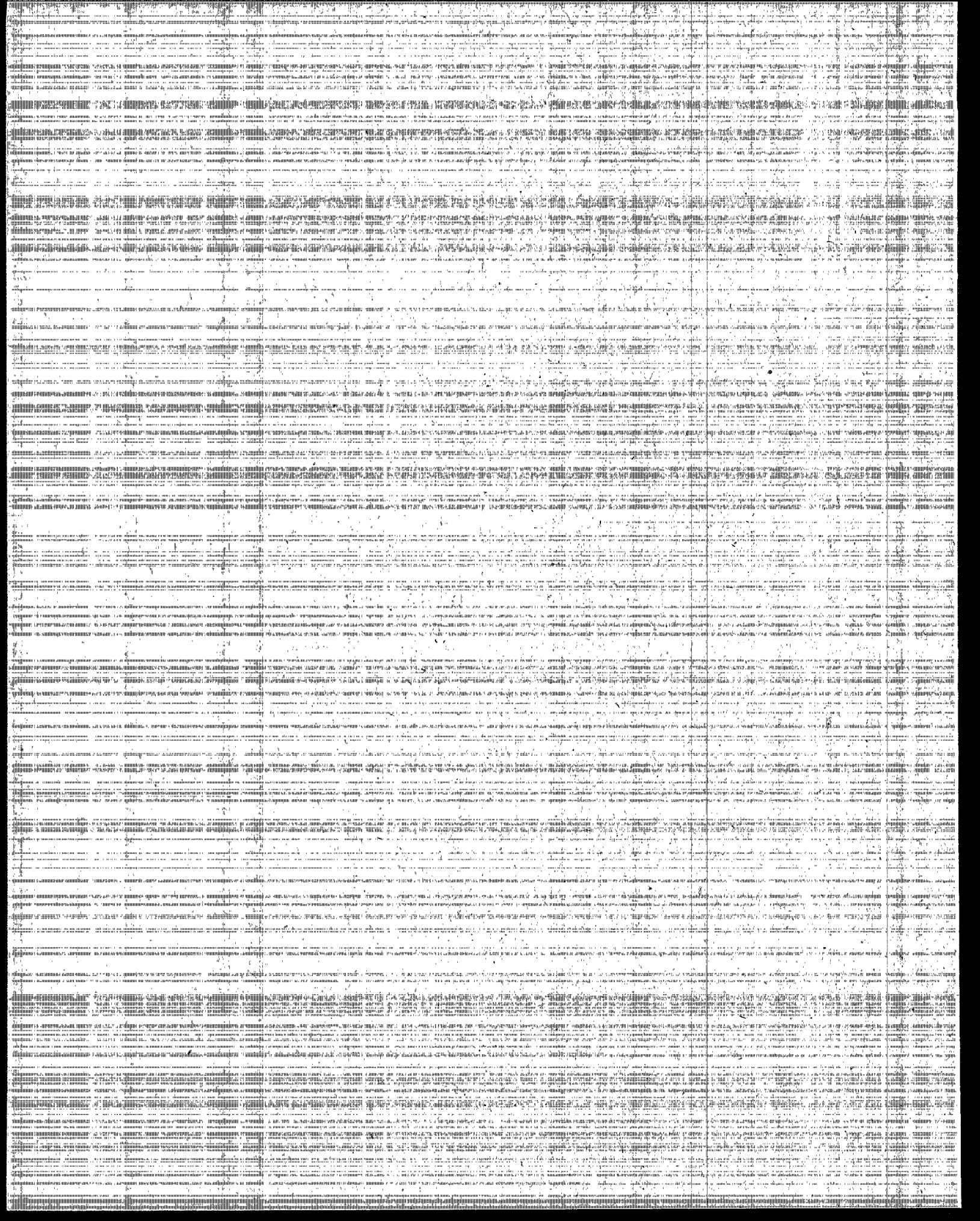
* Also referred to as methylene chloride

Industry exceeded the 33/50 Program's interim 33% reduction goal by more than 100 million pounds in 1992. National emissions of Program chemicals were reduced by an additional 100 million pounds in 1993, bringing total reductions since 1988 to more than 685 million pounds (46%). Facilities' TRI projections suggest that the Program's ultimate 50% reduction goal will be observed to have been achieved or exceeded in the 1994 TRI data, a full year ahead of schedule. The 1,300 companies enrolled in the 33/50 Program have accounted for most of the Program's pollution reductions. Representing just 15% of eligible companies and owning only a third of the facilities reporting Program chemicals to TRI, participants are responsible for 78% of the reductions since 1988 and 98% of the 100 million pounds reduced in 1993.

EPA is committed to recognizing companies for their participation in the 33/50 Program and for the emissions reductions they achieve. The Program issues periodic Progress Reports, in which participating companies are listed and highlighted. In addition, Company Profiles, such as this one, are being prepared to provide more detailed information about how companies have achieved their emissions reductions. Information presented in these profiles is drawn from a number of sources, including the company's written communications to the 33/50 Program, extensive interviews with company representatives, the annual TRI reports submitted by the company's facilities (including Pollution Prevention Act data reported to TRI in Section 8 of Form R), and, in many cases, site visits to one or more of the company's facilities. Mention of trade names, products, or services in this document does not convey, and should not be interpreted to convey, official EPA approval, endorsement, or recommendation.

Copies of other 33/50 Program Company Profiles, as well as Reductions Highlights documents summarizing all of these Profiles, may be obtained by contacting the Program as specified in the box below. In addition, all written company communications to EPA regarding the 33/50 Program are available to the public upon request.

For information on the 33/50 Program, contact the TSCA Hotline at (202) 554-1404 or contact 33/50 Program staff directly by phone at (202) 260-6907 or by mail at Mail Code 7408, Office of Pollution Prevention and Toxics, U.S. EPA, 401 M Street, SW, Washington, D.C. 20460.



INLAND STEEL COMPANY

SUMMARY

Inland Steel Company reduced annual releases and transfers of 33/50 Program chemicals from 5,174,500 pounds in 1988 to 733,786 pounds in 1993. This translates to a reduction of approximately 86 percent. The company accomplished all of these reductions at its Indiana Harbor Works (IHW) steelmaking facility. In light of its success in reducing releases and transfers, Inland recently amended its 33/50 Program reduction goal to 90 percent in place of its original 50 percent reduction goal.

This case study provides an overview of Inland Steel's experiences related to the 33/50 Program. It highlights the reductions achieved by two projects undertaken at the IHW — the replacement of tetrachloroethylene cleaning with aqueous processes, and the recycling of blast furnace and steelmaking dust and sludges. In addition to these projects, Inland achieved large reductions in releases and transfers of 33/50 Program chemicals as a result of several additional actions — the elimination of on-site landfilling of slag and the closure of the facility's coking operations. Slag, which had previously been used to fill in the portion of Lake Michigan on which the IHW is sited, is now sold to a company that uses it in the manufacture of products such as concrete. Coke is now purchased from an outside supplier.

COMPANY BACKGROUND

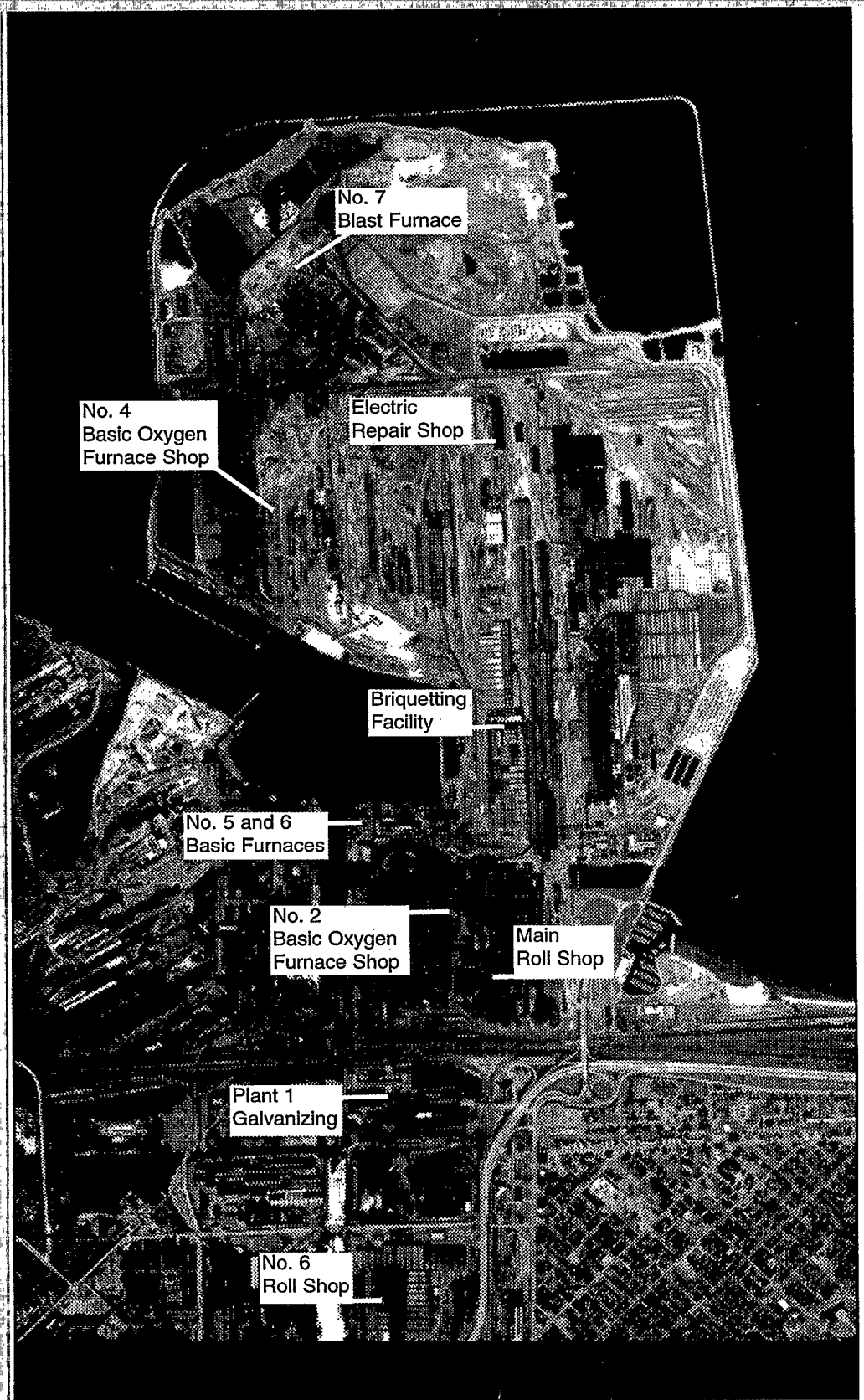
Inland Steel
a subsidiary of
Inland Steel Industries, Inc.

Inland Steel Company, one of the business units owned by Inland Steel Industries, Inc., is the fifth largest integrated steel producer in the United States. Its products accounted for approximately five percent of U.S. steel production in 1993. As an integrated producer, Inland mines ore and produces iron as well as most of the raw steel used in its manufacturing operations. The company employed approximately 12,000 individuals in 1993.

Inland operates a 2,400 acre (approximately 3.5 square miles) steelmaking facility known as the Indiana Harbor Works (IHW) in East Chicago, Indiana. With an annual production capacity of 5.8 million tons of raw steel, this facility is one of the largest steelmaking facilities in the U.S. The IHW was originally built in 1897 on the shore of Lake Michigan and began steelmaking operations in 1903. Since that time, the facility has expanded significantly and now sits on a man-made peninsula extending into Lake Michigan. An aerial view of the facili-

Exhibit 1

Aerial View of Inland Steel's Indiana Harbor Works Facility



ty is shown in Exhibit 1. The facility contains a wide variety of operations, including blast furnaces, basic oxygen furnaces, electric arc furnaces, cold-roll shops, hot-roll shops, and a number of repair shops. The facility also had coking operations, which were closed in 1993.

Inland Steel's final products are manufactured by two divisions — Inland Steel Bar Company and Inland Steel Flat Products Company. Inland Steel Bar Company manufactures and sells steel bars, which account for approximately 10 percent of Inland Steel Company's shipments each year. The Bar Company's products are used in a wide variety of applications, including transportation (axles and steering columns), cold finishing, forging, mining, heavy equipment manufacturing, and in steel service centers.

In 1993, Inland Steel shipped approximately 4.8 million tons of steel and had net sales of nearly $2.2 billion.

Inland Steel Flat Products Company manufactures and sells sheet steel and steel plate, which account for approximately 90 percent of Inland Steel Company's annual shipments. Products include hot-rolled, cold-rolled, and coated steel sheet primarily utilized by the automotive, appliance, office furniture, electrical motors, and steel service center industries. In addition, the Flat Products Company produces steel plate for the agriculture, rail, construction, and steel service center industries.

In 1993, Inland Steel shipped approximately 4.8 million tons of steel and had net sales of nearly $2.2 billion.

Environmental Strategy

In addition to its participation in the 33/50 Program, Inland Steel has a number of other initiatives to help protect the environment. The company supports domestic and international efforts to conserve energy and natural resources while pursuing economic development. It endorses the International Chamber of Commerce's "Business Charter for Sustainable Development Principles for Environmental Management" and has adapted these Principles to Inland as shown in Exhibit 2. The company is also a Charter Member of WasteWi$e, a U.S. EPA voluntary program to promote solid waste reduction and recycling.

The Environmental Health and Safety Department of Inland Steel is responsible for working with operating personnel to carry out the mandates of its environmental program. Ongoing efforts include the implementation of formal waste minimization programs at each operating facility (e.g., Blast Furnace Shops, Basic Oxygen Furnace Shops, Cold Mill) and an ongoing environmental audit program to ensure compliance with applicable regulations.

Inland Steel holds a patent on an innovative pollution control technology to reduce sulfur dioxide emissions from coal-fired electricity generation.

Inland Steel holds a patent on an innovative pollution control technology to reduce sulfur dioxide emissions from coal-fired electricity generation. This technology involves limestone injection and is installed at the IHW's coal-fired

Exhibit 2

Inland Steel's Adaptation of the International Chamber Of Commerce's Principles For Environmental Management

1. *Integrate responsible environmental policies, programs, and practices into each business unit as an essential element of management;*
2. *Plan, install, maintain, and operate facilities to be in compliance with applicable environmental laws and regulations;*
3. *Minimize generation of wastes and promote recycling, recovery and reuse of residual materials to the maximum extent practicable, and dispose of any remaining wastes in an environmentally responsible manner;*
4. *Encourage research and development related to environmental control technologies and more efficient utilization of natural resources, materials, and energy;*
5. *Participate in the development of technologically sound and cost-effective environmental laws and regulations;*
6. *Communicate with share holders, the Board of Directors, employees, customers, suppliers, community officials, and the public on environmental issues and progress towards meeting objectives; and*
7. *Educate, train, and motivate employees to conduct themselves in an environmentally responsible and safe manner.*

No. 4 A.C. Power Station. This technology is currently being marketed to other companies by an outside firm.

Overview of 33/50 and TRI Chemical Releases and Transfers

Since 1988, Inland Steel has reported releases and transfers of 11 of the 17 33/50 Program chemicals. The following is a list of these chemicals and their source of releases at Inland Steel:

Chromium, lead, and nickel compounds are present in blast furnace and basic oxygen furnace slag, waste dust, and sludges that have historically been landfilled on-site (slag) or transferred off-site (dust and sludge).

Benzene, cyanide compounds, toluene, and xylene were generated as byproducts in the manufacturing of coke used in the steelmaking process, and were released primarily as air emissions.

Dichloromethane and methyl ethyl ketone (MEK) were used as solvents for hand-cleaning of parts, and were released as air emissions.

Tetrachloroethylene was used to clean a variety of parts in vapor degreasing equipment, and was released entirely as air emissions.

1,1,1-Trichloroethane was tested as a replacement for tetrachloroethylene in cleaning applications in 1990, and was released entirely as air emissions.

In March of 1991, the company set a goal of reducing releases and transfers of 33/50 Program chemicals by 33 percent in 1992 and by 50 percent in 1995, using 1988 as a baseline.

According to data provided by the company, releases and transfers of eight of these 11 chemicals were still reported in 1993; those not reported are dichloromethane, methyl ethyl ketone (replaced with alternative solvents such as mineral spirits), and 1,1,1-trichloroethane (tested in 1990 but not implemented as an alternative for tetrachloroethylene).

33/50 Chemicals (1000s lbs.)	1988	1993
Benzene	1,246	80
Chromium Compounds	1,627	269
Cyanide Compounds	27	7
Dichloromethane	12	NR
Lead Compounds	943	176
Methyl Ethyl Ketone	12	NR
Nickel Compounds	432	15
Tetrachloroethylene	417	181
Toluene	251	4
1,1,1-Trichloroethane*	NR	NR
Xylene	206	1
33/50 Subtotal**	5,175	734
Other TRI Chemicals	56,190	10,155
TOTAL	61,365	10,889

NR *Not Reported*

* *20,000 lbs. of 1,1,1-Trichloroethane were reported as "Air Emissions" in 1990.*

** *Columns may not sum to totals due to rounding.*

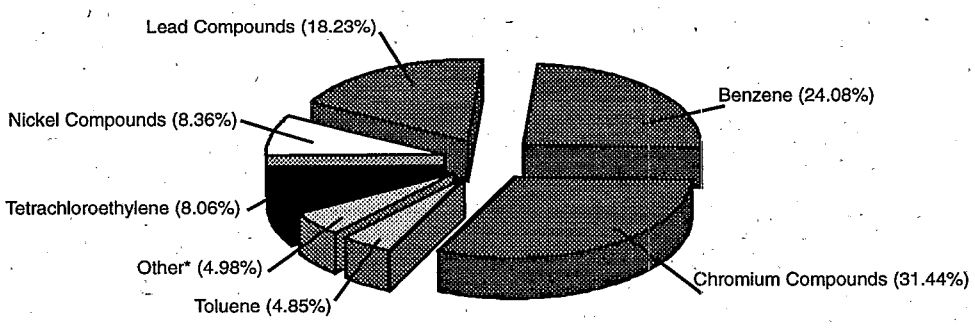
Exhibit 3

Releases and Transfers of TRI Chemicals by Inland Steel Company (in Thousands of Pounds)

In the 33/50 Program's base year of 1988, Inland Steel reported a total of 61,364,500 pounds of releases and transfers of TRI chemicals. Of this total, 5,174,500 pounds were of 33/50 Program chemicals. Exhibit 3 presents the company's TRI data for 1988 and 1993. Exhibit 4 shows the breakdown of 33/50 chemicals used at Inland during 1988. These data are presented in greater detail in Appendix A. The largest percentage of total 33/50 chemical releases and transfers were from chromium releases to land, accounting for approximately 31 percent, and benzene emissions to air, accounting for approximately 24 percent.

In August 1993, Inland Steel recognized that it had achieved its original goal of a 50 percent reduction several years ahead of schedule.

As shown in Exhibit 5, Inland Steel's 1988 releases and transfers of 33/50 Program chemicals were split between releases to land (50 percent of total) and to air (42 percent of total), with transfers off-site and releases to surface water accounting for the remainder. The releases to land resulted primarily from Inland's use of its slag as fill for the expansion of the IHW facility. Until recent-



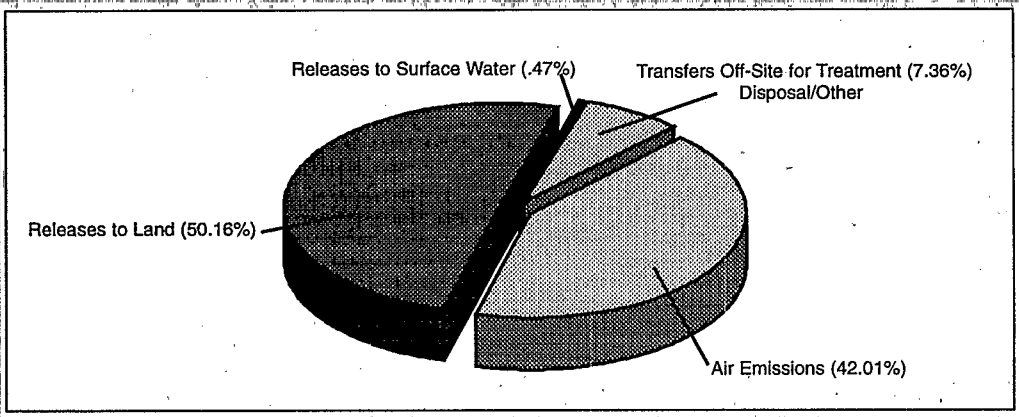
*Other: Xylene, Cyanide Compunds, Dichloromethane, and MEK

Exhibit 4

Percentage Breakdown of 33/50 Chemical Releases and Transfers for 1988 (by Chemical)

Exhibit 5

Percentage Breakdown of 33/50 Chemical Releases and Transfers for 1988 (by Media)



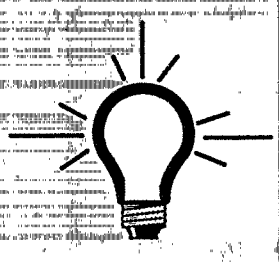
ly, Inland Steel used blast furnace slag to fill in the Indiana Shoals, the portion of Lake Michigan on which the company's man-made peninsula is located. During this period, the metals in the slag were reported to the TRI as releases to land. Inland now sells the slag to a company that uses it in a variety of processes, such as the manufacture of concrete. Benzene, toluene, and xylene, which are byproducts of the coke manufacturing process, accounted for a large portion of the air emissions in 1988. Inland closed its coke manufacturing facilities at the IHW in 1993 and began purchasing coke from an outside supplier.

33/50 Program Goals and Reduction Projects

When Inland Steel joined the 33/50 Program in March, 1991, the company set a goal of reducing releases and transfers of 33/50 Program chemicals 33 percent by 1992 and 50 percent by 1995, using 1988 as a baseline. These percentages translate to a reduction of 1,707,585 pounds by 1992 and 2,587,250 pounds by 1995 from 1988 levels of 5,174,500 pounds. At the time, the company indicated that while it expected to meet or exceed this goal, reductions for certain chemicals might be less than 50 percent by 1995 because of limitations in available technologies.

In August 1993, Inland Steel recognized that it had achieved its original goal of a 50 percent reduction several years ahead of schedule. In order to further its participation in the 33/50 Program, the company revised and augmented its goal to a 90 percent reduction in releases and transfers of 33/50 Program chemicals by 1995. This translates into a pledged reduction of 4,657,050 pounds.

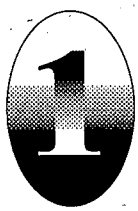
The overall implementation of the 33/50 Program at Inland Steel's IHW steelmaking facility is the responsibility of the 30-member Environmental, Health, and Safety staff. Several employees in this office, working with operating personnel, are tasked with identifying areas in which releases and transfers of 33/50 Program chemicals can be reduced and eliminated, as well as with evaluating and implementing projects to achieve these reductions.



One of the first projects identified by Inland Steel that would assist in achieving its 33/50 Program goal was reducing the use of tetrachloroethylene in solvent cleaning applications.

The next sections describe two of the projects that reduced releases and transfers of four 33/50 Program chemicals: replacing tetrachloroethylene cleaning with aqueous cleaning, and recycling blast furnace and steelmaking dust and sludges.

Project #1: Replace Tetrachloroethylene Cleaning with Aqueous Cleaning



One of the initial projects identified by Inland Steel that would assist the company in achieving its 33/50 Program goal was reducing the use of tetrachloroethylene in solvent cleaning applications. After investigating tetrachloroethylene usage at the facility, Inland staff found that the largest quantities were used in four pieces of vapor degreasing equipment — two in the Electric Repair Shop and one in each of two roll shops. The degreasers in the Electric Repair Shop were used to clean electric motors and other electrical equipment, while the degreasers in the roll shops were used to degrease roll bearings used in the steel rolling lines. Inland agreed to replace the degreasers in the Electric Repair Shop as part of a Consent Decree with Region V of the EPA. As part of the agreement, the company was allowed to apply part of the cost of equipment installation towards a fine levied against the company for late submission of its 1987 TRI report. The replacement of the degreasers in the roll shops was voluntary and has been attributed by the company to participation in the 33/50 Program.

Inland's primary objective in the search for an alternative cleaning method was to eliminate the use of all solvents, if possible.

After identifying degreasing as the major use of tetrachloroethylene at the facility, Inland staff and operating personnel set out to identify an alternative cleaning method. Inland's primary objective in the search for an alternative cleaning method was to eliminate the use of all solvents, if possible. As the search was initiated, the team observed that motors were being successfully cleaned using an aqueous detergent system at Inland's Mobile Equipment Repair Shop located at another part of the facility. Consequently, the team decided to implement such a system at the Electric Repair Shop and the two roll shops.

The generation of hazardous waste has been completely eliminated with the switch to the aqueous cleaning system.

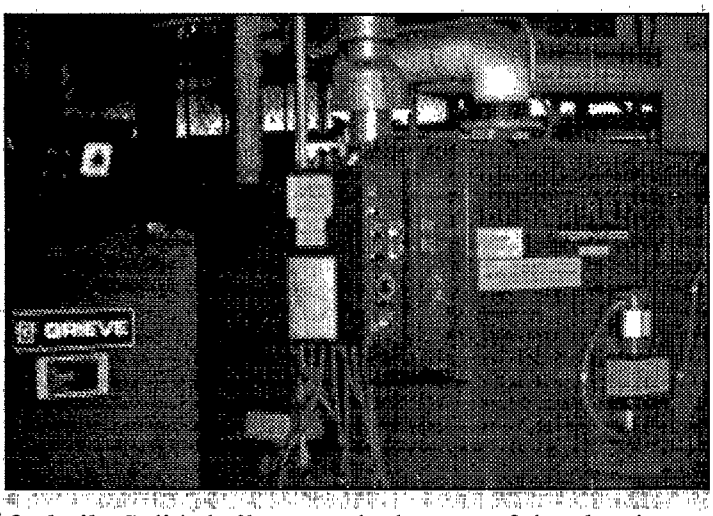
Because aqueous cleaning cannot be carried out using standard vapor degreasing equipment, the project implementation team next identified the equipment that would be necessary for the new process. In addition to considering the equipment used in the Mobile Equipment Repair Shop, the team gathered information on cleaning equipment from a number of industry trade journals. However, most of the equipment identified turned out to be parts washers, which were not well suited for a heavy industrial application. After further dialogue with the operators in the Mobile Equipment Repair Shop about their aqueous cleaning process, the team concluded that the same process most likely would be adequate for replacing the tetrachloroethylene vapor degreasers in the electric repair shop and the roll shops.

The equipment selected to replace each of the vapor degreasers in the Electric Repair Shop is manufactured by MART Incorporated. One of the pieces

purchased is shown in Exhibit 6. Similar equipment manufactured by Proceceo was purchased for the roll shops. Each unit is a large steel-plate box with a front-hinged door. The inside of the equipment is lined with fine-tipped water-jet spray nozzles. In the first step of the cleaning process, the parts are blasted with hot water to remove grease and dirt. The dirty water from this process flows to a reservoir in the bottom of the unit where some of the solids settle out and the grease and oil are skimmed off. The second portion of the cleaning process is a rinse stage where the parts are sprayed with clean water. This step serves a dual purpose of rinsing the parts and replacing water that may have escaped as steam from the unit. After the rinse stage, the parts are removed from the machine and dried in a separate drying oven.

Exhibit 6

The Aqueous Degreaser Pictured Here Was Installed in December of 1993 to Replace the Tetrachloroethylene Vapor Degreaser



There is no wastewater discharge associated with this cleaning process. Water is lost through steam generation and must be replaced with fresh water as described above. The grease and oil that are skimmed from the cleaning water are sent to an on-site oil reclamation facility and are blended into fuel oil. Solids built up on the bottom of the cleaning unit are removed quarterly and are disposed of as a non-hazardous RCRA Subtitle D waste. The wastes from the vapor degreasers had been RCRA listed hazardous wastes (F002).

The cleaning solution used in Inland Steel's new process is hot water with an added detergent/cleaner. The cleaner used is a non-caustic alkaline cleaner called Roundhouse and is manufactured by Calgon Corporation.

With the new aqueous systems, the cost of water is negligible, and the cost of the aqueous cleaner used in all four machines is less than $500 per year.

The environmental, health, and safety impacts of the new aqueous cleaning system are all less than those associated with the previous tetrachloroethylene vapor degreasing system. For both systems, the major environmental impact is disposal of the cleaning solution. In the past, the spent tetrachloroethylene required handling and disposal as a hazardous waste. With the aqueous cleaning system, the water is continuously recycled back into the cleaning process, while the waste grease and oil are blended into fuel oil and the solids are disposed of quarterly as a non-hazardous waste. Therefore, the generation of hazardous waste has been completely eliminated with the switch to the new process.

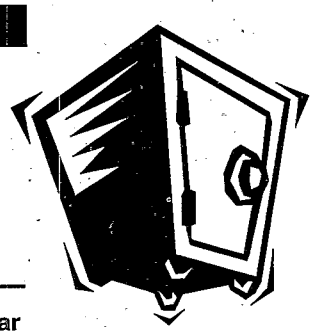
Potential adverse health effects, which resulted from worker exposure to tetrachloroethylene vapors, were reduced with the switch to aqueous cleaning. Tetrachloroethylene has been classified by the U.S. EPA as a "possible/probable"

carcinogen. Although the vapor degreasers were covered by hoods, solvent vapors were released into the work area when the equipment was opened for loading and unloading. While concentrations of tetrachloroethylene did not exceed the Permissible Exposure Limit (PEL) of 100 ppm, the vapors posed some risk to the workers and created an unpleasant odor in the shop. One of the constituents of the Calgon aqueous cleaner used at Inland Steel is dipropylene glycol methyl ether, which also has a PEL of 100 ppm. However, this constituent makes up less than five percent of the total cleaner formulation. In addition, the aqueous degreasing equipment vents to the outdoors rather than into the work area. As a result, the concentrations of dipropylene glycol methyl ether to which workers are exposed are lower than the concentrations of tetrachloroethylene. Based on these factors, Inland Steel's workers presumably face fewer health and safety risks with the use of the aqueous cleaner than they did with the tetrachloroethylene degreasers.

The aqueous cleaning equipment was installed in the Electric Repair Shop in December, 1993, and in the roll shops in October, 1994. Implementing the new aqueous cleaning systems required significant capital expenditures on the part of Inland management. The purchase and installation of the four aqueous cleaning systems cost approximately $200,000. According to the company, the daily operating costs (electricity and gas) for the aqueous cleaning systems are approximately the same as those for the tetrachloroethylene vapor degreasers. However, there are significant cost savings in the purchase of cleaning materials and the disposal of waste. Inland Steel paid approximately $0.23/pound for tetrachloroethylene and approximately $0.19/pound for its disposal. The company estimates that the annual costs for the purchase and disposal of the solvent totalled about $40,000. With the new aqueous systems, the cost of water is negligible, and the cost of the aqueous cleaner used in all four machines is less than $500 per year. The only waste disposal cost associated with the aqueous cleaning process is for the disposal of solids removed from the bottom of the machines. This disposal cost is approximately $2,000 per year for all four machines. Thus, Inland Steel has replaced purchases and disposal costs of $40,000 per year associated with tetrachloroethylene with costs of approximately $2,500 per year for aqueous cleaning (see Exhibit 7).

THE SAVINGS

Old Method	Operating Costs
Tetrachloroethlene Vapor Degreaser	$40,000 a year
New Method	
Aqueous System	$ 2,500 a year
TOTAL SAVINGS	**$37,500 a year**



The company indicated that implementation of the aqueous cleaning system eliminated the use of tetrachloroethylene as of October, 1994.

Exhibit 7

The Yearly Savings to Inland Steel Via Cost Reductions in the Purchase of Cleaning Materials and Their Disposal

Overall, the replacement of tetrachloroethylene vapor degreasers with aqueous systems in parts cleaning applications eliminated the use of tetrachloroethylene at the IHW facility as of October, 1994.

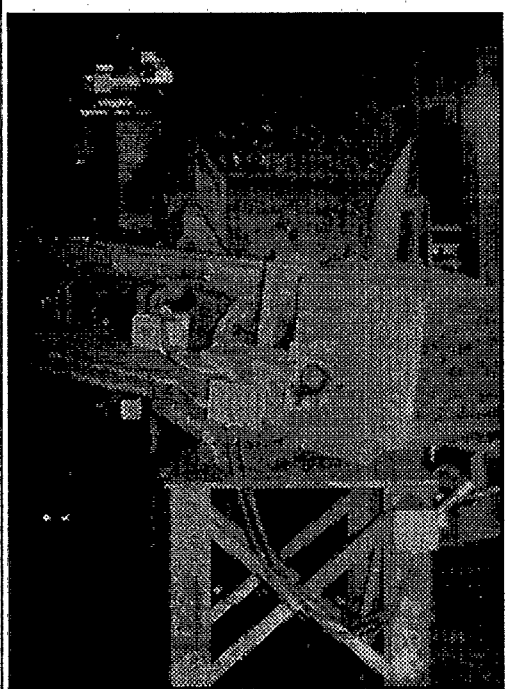
Project #2: Recycle Blast Furnace and Steelmaking Dust and Sludges

Inland Steel's blast furnaces (BF) and basic oxygen furnaces (BOF) are sources of releases and transfers of heavy metals, specifically chromium, lead, and nickel compounds. These metals are found in three types of waste products: slag, dust, and sludges. As previously mentioned, slag is now sold to a company that uses it in the manufacture of concrete and other products. Reducing releases and transfers of chromium, lead, and nickel compounds found in BF and BOF dust and sludge was not as simple as the reductions achieved from the slag. According to the company, participation in the 33/50 Program, coupled with a company desire to implement pollution prevention measures, resulted in Inland's staff searching for a way in which to reduce these releases and transfers. An added incentive was the need to find a practical alternative to high landfill and waste-handling costs.

Studies performed on the furnace dust and sludge wastes found that, in most cases, 90 to 95 percent of the waste was iron. From this information, Inland concluded that it made sense to attempt to recycle the waste so that the iron could be reused in BF and BOF operations. However, because of the very small particle size of these wastes, they could not be reintroduced directly into the furnaces. In order to make these materials useful in blast and basic oxygen furnaces, the size of the particles had to be significantly increased. Rather than trying to identify a method for recycling on their own, Inland staff spoke with a number of waste management companies to solicit ideas for recycling the dust and sludge wastes.

Exhibit 8

Equipment Used in the Briquetting Process



After receiving information on a number of potential methods for recycling this waste, Inland selected a hybrid system comprised of a dewatering system supplied by Baker Hughs, and a briquetting operation designed and operated by National Recovery. The briquetting operation takes dust and sludge wastes and processes them to form small briquettes (about two inches long by one inch wide), which have a high iron content and can be reintroduced into the blast and basic oxygen furnaces. The briquetting equipment is shown in Exhibit 8, and a schematic of the entire process is shown in Exhibit 9.

The sludge dewatering and briquetting processes take place on-site at the IHW and are operated by Baker Hughes and National Recovery. Inland Steel pays these companies for each ton of recycled material that is delivered to a facil-

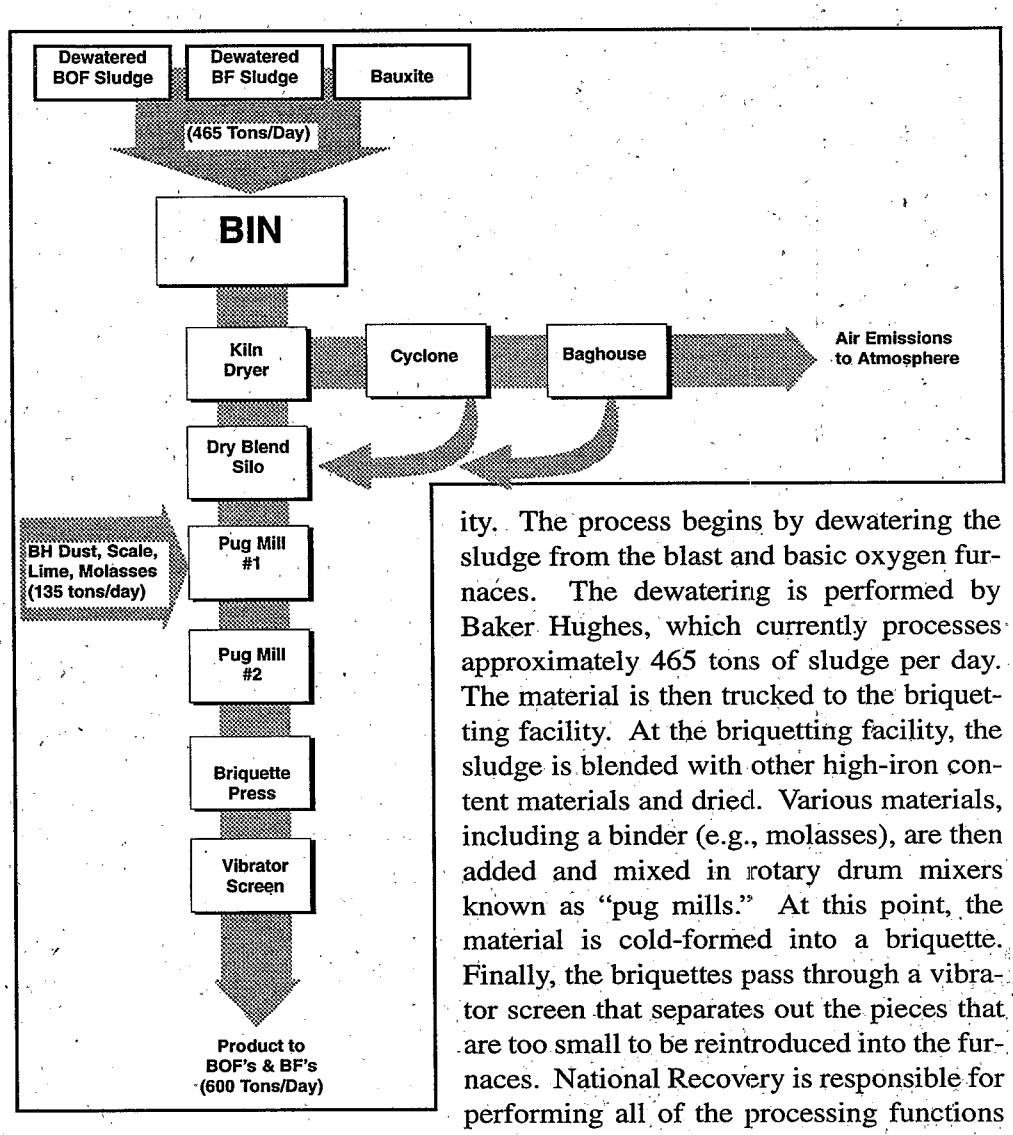


Exhibit 9

Inland Steel's Briquetting Process

ity. The process begins by dewatering the sludge from the blast and basic oxygen furnaces. The dewatering is performed by Baker Hughes, which currently processes approximately 465 tons of sludge per day. The material is then trucked to the briquetting facility. At the briquetting facility, the sludge is blended with other high-iron content materials and dried. Various materials, including a binder (e.g., molasses), are then added and mixed in rotary drum mixers known as "pug mills." At this point, the material is cold-formed into a briquette. Finally, the briquettes pass through a vibrator screen that separates out the pieces that are too small to be reintroduced into the furnaces. National Recovery is responsible for performing all of the processing functions after the dewatering of the sludge. The company has indicated that there are no significant environmental, health, or safety impacts associated with the briquetting operation.

According to the company, participation in the 33/50 Program, coupled with high landfill and waste-handling costs, resulted in Inland's staff searching for a way to reduce releases and transfers of chromium, lead and nickel compounds.

At the present time, the briquetting operation is capable of generating 600 tons of recycled material per day (219,000 tons per year) that can be fed into the facility's blast and basic oxygen furnaces. Inland estimates that the annual amount of sludges used in the briquetting operation contains approximately 7,277,000 pounds of metals. This total includes approximately 216,000 pounds of 33/50 Program chemicals — 22,000 pounds of chromium compounds, 186,000 pounds of lead compounds, and 8,000 pounds of nickel compounds. The remainder of the metals are primarily manganese, copper, and zinc.

Because the briquetting operation is still in the pilot stage at Inland Steel, it does not currently result in cost savings. At present, the company estimates that the briquetting operation costs between $40 and $50 per ton of sludge

processed, while the cost of landfilling the sludges would be approximately $35 per ton. In addition, the company is experiencing some problems in maintaining the consistency of output from the briquetting process. The fairly significant variability in the rate of production of briquettes during the pilot testing stage has posed some problems for operators of the basic oxygen furnace that accepts the briquettes. However, the company expects both the cost and consistency problems to correct themselves as the process is improved and the volume of sludge briquetted is increased.

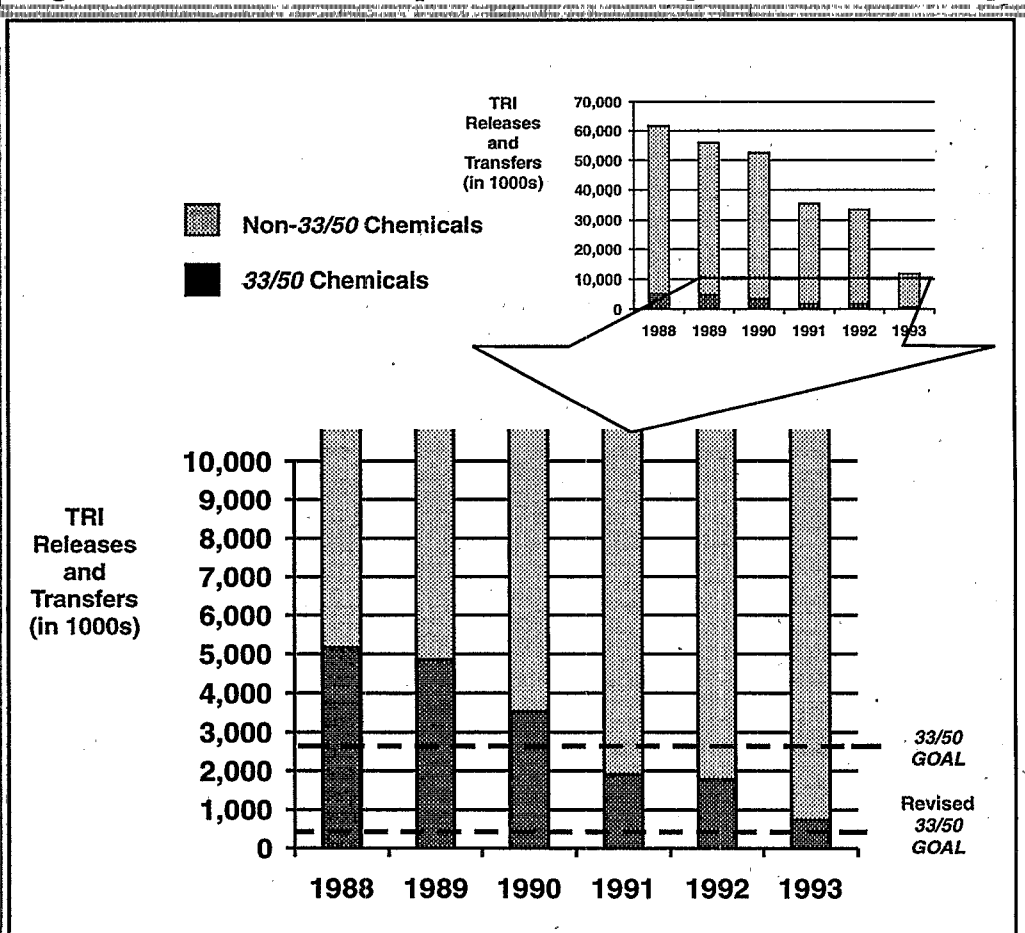
33/50 Progress and TRI Data Summary

Inland Steel has successfully worked toward achieving its 33/50 Program goals. As mentioned previously the company realized that it could reduce releases and transfers that were below its initial goal of a 50 percent reduction several years ahead of schedule. As a result, the company officially amended its goal to a 90 percent reduction by 1995. According to 1993 TRI data, Inland Steel has almost met its revised goal as of the end of 1993 (see Exhibit 10).

Inland Steel reported 733,786 pounds of releases and transfers of 33/50 Program chemicals in 1993, compared with 5,174,500 pounds in 1988. This rep-

Exhibit 10

Inland Steel's Progress Toward Meeting 33/50 Goals



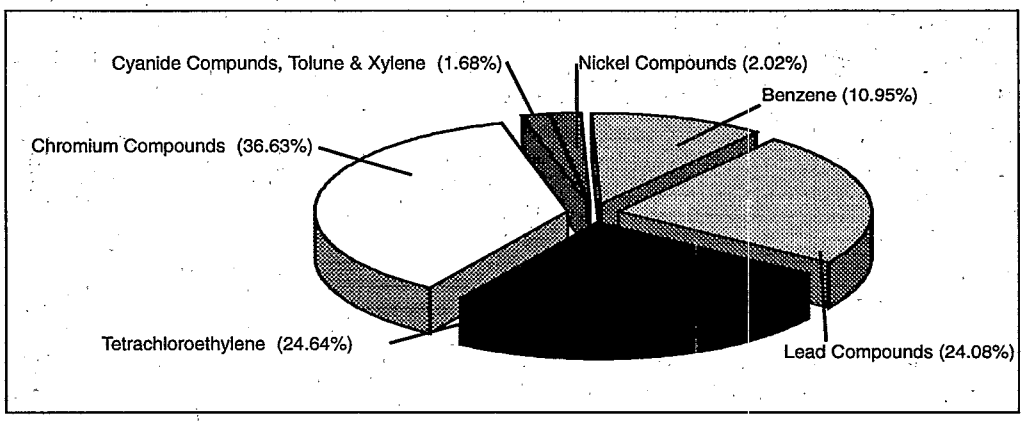


Exhibit 11

Percentage Breakdown of 33/50 Chemical Releases and Transfers in 1993 (by Chemical)

resents an overall reduction of approximately 86 percent. (Exhibits 11 and 12 offer further information on Inland's transfers and releases for 1993.) This reduction included a complete elimination of releases and transfers of dichloromethane and methyl ethyl ketone.

The other contributors to Inland's reductions include the following:

Chromium compounds	1,358,078 pounds (83%)
Lead compounds	767,039 pounds (81%)
Nickel compounds	417,624 pounds (97%)
Tetrachloroethylene	236,078 pounds (57%)

The company expects the implementation of the briquetting process to reduce releases and transfers of 33/50 Program chemicals by approximately 216,000 pounds per year.

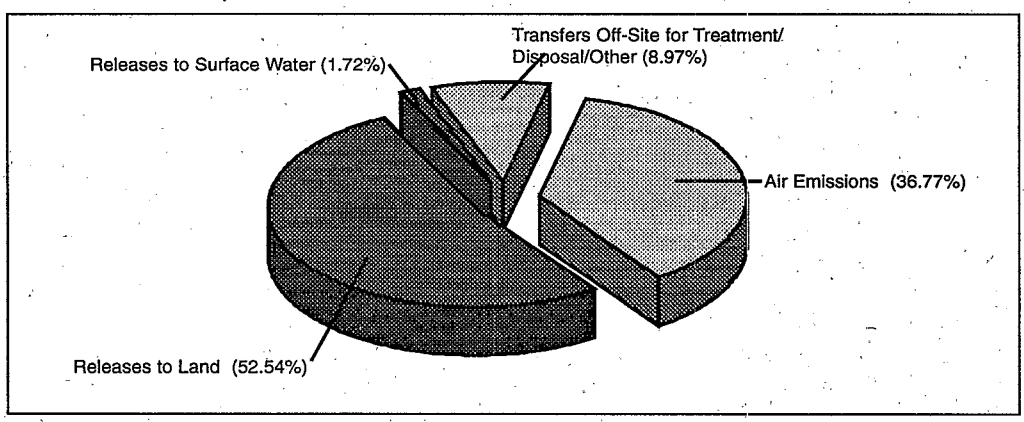


Exhibit 12

Percentage Breakdown of 33/50 Chemical Releases and Transfers in 1993 (by Media)

As noted previously, the majority of these reductions were achieved by two activities not discussed in this case study: the elimination of on-site landfilling of slag and the closure of the facility's coking operations. Slag, which had previously been used to fill in the portion of Lake Michigan on which the IHW is sited, is now sold to a company that uses it in the manufacture of products like concrete. Coke is now purchased from an outside supplier.

The two activities discussed in this case study — the replacement of tetrachloroethylene cleaning with aqueous processes, and the recycling of blast furnace and steelmaking dust and sludges — were both implemented recently and their impacts on releases and transfers of 33/50 Program chemicals will therefore not be observed until 1994 TRI data are compiled. The company indicated that implementation of the aqueous cleaning system eliminated the use of tetrachloroethylene as of October, 1994. The company expects the implementation of the briquetting process to reduce releases and transfers of 33/50 Program chemicals by approximately 216,000 pounds per year.

Although it was not a part of the 33/50 Program goal, Inland Steel has also significantly reduced releases and transfers of non-33/50 TRI chemicals during the period 1988 to 1993. According to the company's 1993 TRI data, total non-33/50 TRI releases and transfers were 10,155,227 pounds in 1993, a reduction of 46,034,773 pounds (82 percent) from 1988. The majority of these reductions can be attributed to reductions in manganese compounds (36,069,829 pounds - an 83 percent reduction), hydrochloric acid (5,865,242 pounds - a 99 percent reduction), and zinc compounds (3,013,874 pounds - a 60 percent reduction).

Contact for Further Information

For additional information on any of the information provided in this case study, please contact the following individual:

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Appendix A

Inland Steel Company

Releases and Transfers of TRI Chemicals, 1988-1993

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Underground Injection (pounds)	Releases to Land (pounds)	Transfers to POTW (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1993 Total Releases and Transfers
Benzene	1988	1,246,000	0	0	0	0	0	1,246,000	
	1989	1,231,000	250	0	0	0	0	1,231,250	
	1990	996,000	5	0	0	0	0	996,005	
	1991	186,000	0	0	0	0	0	186,000	
	1992	148,053	0	0	250	0	0	148,303	
	1993	80,411	0	0	0	0	0	80,411	-94%
Chromium compounds	1988	2,350	0	0	1,600,000	0	24,700	1,627,050	
	1989	1,850	0	0	1,400,000	0	78,500	1,480,350	
	1990	670	0	0	1,300,000	0	76,642	1,377,312	
	1991	550	0	0	1,000,000	0	100,337	1,100,887	
	1992	500	0	0	1,059,506	0	36,644	1,096,650	
	1993	500	0	0	244,337	0	24,135	268,972	-83%
Cyanide compounds	1988	5,200	22,000	0	0	0	0	27,200	
	1989	4,300	32,000	0	0	0	0	36,300	
	1990	5,500	23,000	0	0	0	0	28,500	
	1991	4,900	26,000	0	0	0	0	30,900	
	1992	2,994	7,080	0	250	0	0	10,324	
	1993	1,773	5,416	0	0	0	0	7,189	-74%
Dichloromethane	1988	12,000	0	0	0	0	0	12,000	---
Lead compounds	1988	18,500	2,100	0	570,000	0	352,750	943,350	
	1989	17,900	1,900	0	560,000	0	419,000	998,800	
	1990	4,200	6,200	0	200,000	0	302,054	512,454	
	1991	2,700	3,700	0	170,000	0	164,300	340,700	
	1992	2,415	2,635	0	170,869	0	170,307	346,226	
	1993	2,386	7,209	0	126,871	0	39,845	176,311	-81%

Appendix A
Inland Steel Company
Releases and Transfers of TRI Chemicals, 1988-1993

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Underground Injection (pounds)	Releases to Land (pounds)	Transfers to POTW (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1993 Total Releases and Transfers
Methyl ethyl ketone	1988	12,000	0	0	0	0	0	12,000	---
Nickel compounds	1988	3,200	0	0	426,000	0	3,250	432,450	
	1989	2,700	0	0	420,000	0	4,700	427,400	
	1990	290	0	0	57,000	0	3,655	60,945	
	1991	260	0	0	50,000	0	1,920	52,180	
	1992	230	0	0	51,945	0	500	52,675	
	1993	500	0	0	14,302	0	24	14,826	-97%
Tetrachloroethylene	1988	417,000	0	0	0	0	0	417,000	
	1989	300,000	0	0	0	0	0	300,000	
	1990	250,000	0	0	0	0	0	250,000	
	1991	170,000	0	0	0	0	0	170,000	
	1992	113,532	0	0	0	0	0	113,532	
	1993	179,077	0	0	0	0	1,845	180,922	-57%
Toluene	1988	251,200	0	0	0	0	0	251,200	
	1989	195,750	0	0	0	0	0	195,750	
	1990	141,300	0	0	0	0	0	141,300	
	1991	9,300	0	0	0	0	0	9,300	
	1992	7,056	0	0	250	0	0	7,306	
	1993	4,203	0	0	0	0	0	4,203	-98%
1,1,1-Trichloroethane	1990	20,000	0	0	0	0	0	20,000	---

Appendix A
Inland Steel Company
Releases and Transfers of TRI Chemicals, 1988-1993

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Underground Injection (pounds)	Releases to Land (pounds)	Transfers to POTW (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1993 Total Releases and Transfers
Xylene (mixed isomers)	1988	206,250	0	0	0	0	0	206,250	
	1989	200,250	0	0	0	0	0	200,250	
	1990	130,020	0	0	0	0	0	130,020	
	1991	3,030	0	0	0	0	0	3,030	
	1992	4,096	0	0	250	0	0	4,346	
	1993	952	0	0	0	0	0	952	-100%
33/50 Program Chemicals	1988	2,173,700	24,100	0	2,596,000	0	380,700	5,174,500	
	1989	1,953,750	34,150	0	2,380,000	0	502,200	4,870,100	
	1990	1,547,980	29,205	0	1,557,000	0	382,351	3,516,536	
	1991	376,740	29,700	0	1,220,000	0	266,557	1,892,997	
	1992	278,876	9,715	0	1,283,320	0	207,451	1,779,362	
	1993	269,802	12,625	0	385,510	0	65,849	733,786	-86%
Hydrochloric acid	1988	200,000	0	5,700,000	0	0	0	5,900,000	
	1989	230,000	0	6,700,000	0	0	0	6,930,000	
	1990	230,000	0	4,400,000	0	0	0	4,630,000	
	1991	150,000	0	0	6,200	0	0	156,200	
	1992	146,383	0	0	0	0	962	147,345	
	1993	34,758	0	0	0	0	0	34,758	-99%
Manganese compounds	1988	29,000	0	0	43,000,000	0	550,750	43,579,750	
	1989	28,000	0	0	38,000,000	0	821,050	38,849,050	
	1990	39,000	0	0	39,000,000	0	903,170	39,942,170	
	1991	24,400	0	0	28,000,000	0	458,200	28,482,600	
	1992	25,267	0	0	26,843,808	0	27,560	26,896,635	
	1993	26,111	0	0	7,475,973	0	7,837	7,509,921	-83%

Appendix A
Inland Steel Company
Releases and Transfers of TRI Chemicals, 1988-1993

Chemical	Year	Total Air Emissions (pounds)	Surface Water Discharges (pounds)	Underground Injection (pounds)	Releases to Land (pounds)	Transfers to POTW (pounds)	Transfers Off-site for Treatment/ Disposal/Other (pounds)	Total Releases and Transfers (pounds) (1)	Percent Change 1988-1993 Total Releases and Transfers
Zinc compounds	1988	93,000	7,300	0	4,400,000	0	544,150	5,044,450	
	1989	85,000	5,900	0	4,400,000	0	807,550	5,298,450	
	1990	59,000	12,000	0	2,600,000	0	872,820	3,543,820	
	1991	38,000	1,500	0	1,800,000	0	195,740	2,035,240	
	1992	36,897	3,045	0	1,823,151	0	27,505	1,890,598	
	1993	36,437	2,935	0	1,985,639	0	5,565	2,030,576	-60%
All Non-33/50 Program Chemicals	1988	570,250	1,200,500	5,840,000	47,444,600	24,800	1,109,850	56,190,000	
	1989	558,300	980,600	6,740,000	42,446,050	0	1,678,250	52,403,200	
	1990	566,725	913,100	4,406,600	41,662,050	0	1,917,065	49,465,540	
	1991	435,110	628,400	0	29,859,455	0	784,784	31,707,749	
	1992	323,808	566,976	0	28,720,862	0	195,212	29,806,858	
	1993	165,175	307,467	0	9,478,140	0	204,445	10,155,227	-82%
All TRI Chemicals	1988	2,743,950	1,224,600	5,840,000	50,040,600	24,800	1,490,550	61,364,500	
	1989	2,512,050	1,014,750	6,740,000	44,826,050	0	2,180,450	57,273,300	
	1990	2,114,705	942,305	4,406,600	43,219,050	0	2,299,416	52,982,076	
	1991	811,850	658,100	0	31,079,455	0	1,051,341	33,600,746	
	1992	602,684	576,691	0	30,004,182	0	402,663	31,586,220	
	1993	434,977	320,092	0	9,863,650	0	270,294	10,889,013	-82%
Percent Change, 1988-1993									
33/50 Program Chemicals		-88%	-48%	--	-85%	--	-83%	-86%	-86%
Non-33/50 Program chemicals		-71%	-74%	-100%	-80%	-100%	-82%	-82%	-82%
All TRI Chemicals		-84%	-74%	-100%	-80%	-100%	-82%	-82%	-82%

(1) 1991, 1992, and 1993 Total Releases and Transfers do not include transfers off-site for recycling or energy recovery.