The Case Against Compromising Alamance County's Health, Safety and General Welfare

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Overview

Alamance County is considering the adoption of a Heavy Industrial Development Ordinance. Among other items, the new draft ordinance states: "industrial land uses, by their very nature, may produce objectionable secondary effects, including aesthetic impact, traffic, noise, odors, vibrations, fumes, light, smoke, and/or other impacts, upon the lands adjacent to them." This statement is a sound basis for the adoption of an ordinance "maintaining the health, safety, and general welfare standards of established residential and commercial areas."

However, the draft ordinance also states that, "the current *economic situation* reveals the need for a better balancing act…." (emphasis added)

The task before the County is not to decide between jobs and clean air. The state of the economy is often used to promote ideas which people would not otherwise choose: bankruptcy, band-aids or blackened skies. Protecting people and their homes is not a balancing act.

Alamance County acted wisely in 2006 when it adopted the Polluting Industries Ordinance. It has served the county well. The new ordinance, if adopted, should as well protect residents from all the listed heavy industries:

Fuel Bulk Storage
Ready-Mix Concrete Suppliers
Inert Debris Landfills
Soft Mining/Resource Extraction
Chemical Manufacturing
Electricity Generating Facilities
Automobile Salvage & Storage Facilities
Hard Mining/Resource Extraction/Quarrying
Waste Facilities
Chip Mills
Race Tracks
Asphalt Plants
Landfills-except inert debris
Cement Manufacturing
Galvanizing Facilities
Metal Recycling & Salvage Facilities

As a case in point, this report will center on galvanizing facilities to illustrate why Alamance County should not roll back the protections enacted just five years ago.

Galvanizing Plants

Environmental controls and workplace safety requirements for the galvanizing industry vary from place. Standards in North Carolina are uneven. For example, the

Galvan Industries plant in Cabarrus County has an air permit, but the South Atlantic Galvanizing plant in Graham does not. Despite appeals from plant neighbors, the NC Department of Environment and Natural Resources continues to allow South Atlantic to operate without an air pollution permit. South Atlantic Galvanizing has employed attorneys and consultants in a thus far successful effort to avoid an air quality permit. Yet the continuing dissatisfaction of local residents and the mounting laboratory evidence indicate that there is a persistent problem which must be addressed.

South Atlantic claims that it "has always been in compliance with the rules and environmental regulations to which it is subject."[1] But they also state that the facility does not need an air permit. Blue Ridge Environmental Defense League has demonstrated that the plant should indeed be required to obtain an air permit, but none is forthcoming.

Regulation Needed

Galvanizing plants have multiple sources of noise and pollution. A recently published engineering text on steel galvanizing details the means of controlling pollution, reducing noise and providing for workplace safety. Hot-dip galvanizing plants are hazardous places: the annual industrial injury rate is one worker in five. An expert states:

> The operation of hot - dip galvanizing plants may have the following effects on the environment, which must be limited to the minimum:[2]
> - Air pollution…arising from surface treatment and galvanizing kettle,
> - Noise from mechanical treatment and transport,
> - Risks arising from the handling of water - hazardous substances,
> - The production of hazardous waste.

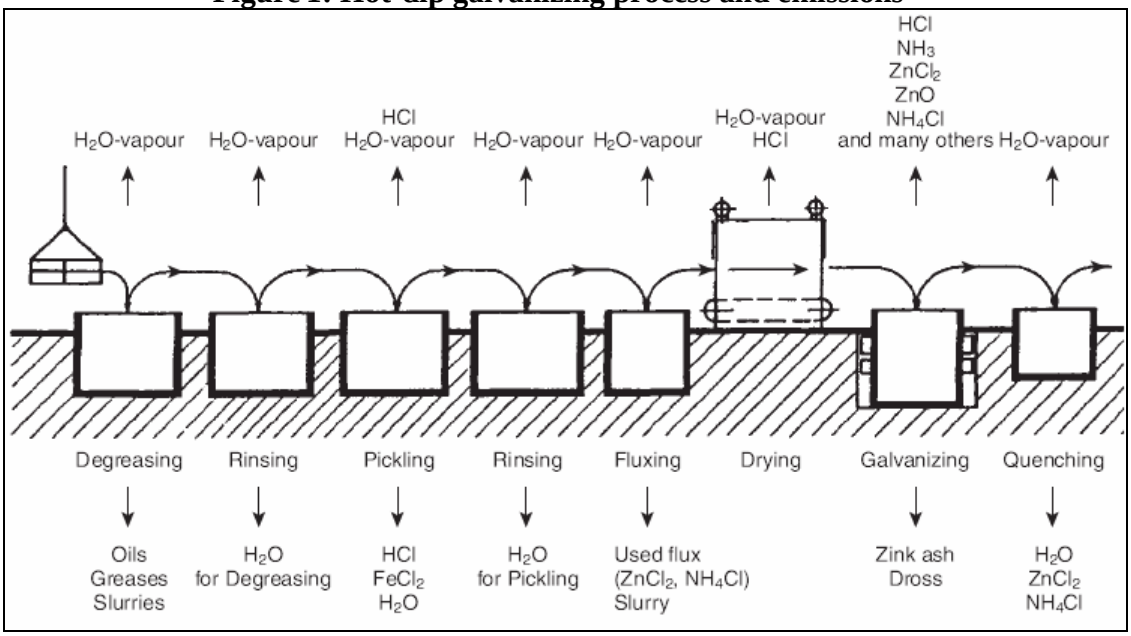
The specific health and environmental risks include emissions of gaseous inorganic chlorine compounds from degreasing, pickling, fluxing and drying such as mineral acids (hydrogen chloride), caustics (ammonia, potassium hydroxide), salts (zinc chloride, calcium chloride, ammonium chloride) oxidizers (potassium chloride) and heterocyclic organic compounds (hexamethylenetetramine $(CH_2)_6N_4$). In addition, liquid and solid wastes and byproducts include oils, water-borne degreasing agents, hydrochloric acid and heavy metal contaminants. Iron hydroxide, found in galvanizing sludge, is a hazardous waste which is irritating to eyes, respiratory system and skin.

The diagram in Figure 1 illustrates the chemical processes and sources of pollution.

[1] "Comments to Alamance County Planning Board Subcommittee submitted on behalf of South Atlantic Galvanizing, 5/25/11"

[2] Kaßner, C. (2011) Environmental Protection and Occupational Safety in Hot-Dip Galvanizing Plants, in Handbook of Hot-Dip Galvanization (eds P. Maaß and P. Peißker), Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany. doi: 10.1002/9783527636884.ch6, Published: 6 APR 2011, ISBN: 9783527323241

Figure 1: Hot-dip galvanizing process and emissions[3]



Much of a galvanizing plant's pollution is emitted into the air as fine particulate matter. Children are especially vulnerable to particulate matter because, relative to their body weight, they breathe more air than adults; outdoor activity magnifies the effect. Epidemiological studies show that there is no safe level of particulate pollution.[4] The more than 50 children attending the school near South Atlantic must be protected from the harmful effects of this pollutant.

Plant neighbors in the Haw River and Graham area report bad odors coming from South Atlantic Galvanizing. The problem is worse at night, when no state inspector has been present. Negative physiological and biological effects of odors include anosmia and hyponosmia.

Zinc and ammonia compounds cause measurable changes in the central nervous system.[5] The zinc used in galvanizing is commonly contaminated with lead. Another contaminant is zinc chromate, a toxic air pollutant.

Means of Reducing Environmental Impacts

In addition to set-backs from homes, schools, churches and commercial areas, the measures available to control pollution and protect workers include air curtains, rim exhausts, hoods and other enclosures. For example, a fan extracts fumes through a

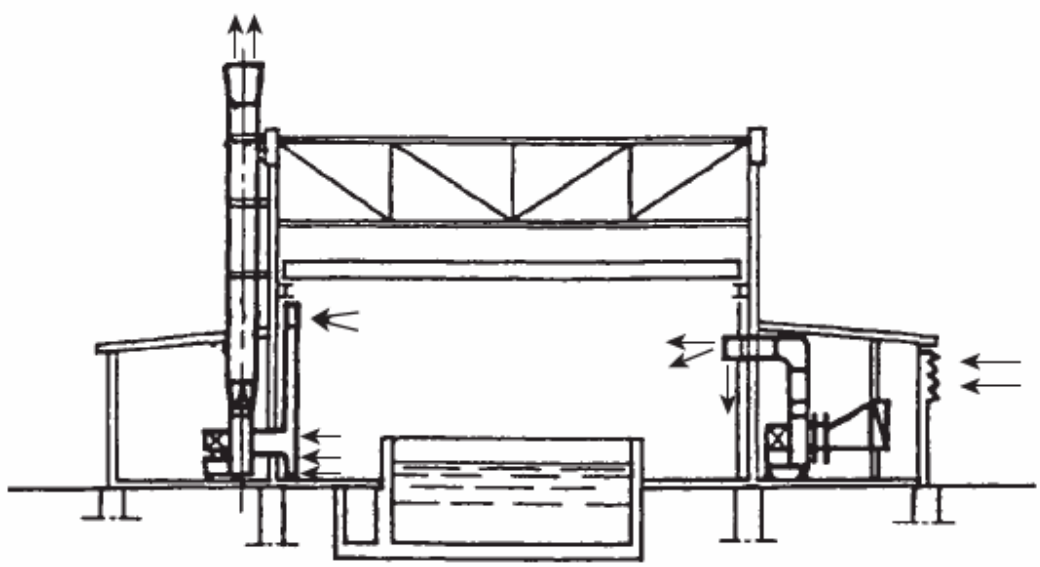
[3] Kaßner, *op cit*, Figure 6.1: Schematic diagram of a hot-dip galvanizing line (batch galvanizing) and possible emissions

[4] Pope et al, *Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution*, JAMA 2002, 287(9):1132-1141

[5] Schiffman SS and Nagle HT, Effect of Environmental Pollutants on Taste and Smell, Otolaryngology–Head & Neck Surgery 106:693-700, 1992

register located on the rim of the chemical bath, creating an air curtain.[6] Following pretreatment, zinc metal operations create large volumes of polluted air.[7] Galvanizing plant exhaust vents employ bag filters—commonly used in cement and asphalt plants—and other types of filters to control dust and particulate matter. Many plants are contained completely inside of buildings (Figure 2), enclose various steps of the galvanizing process (Figure 3) and/or employ ventilation systems with pollution control devices to capture dust-borne pollution and hazardous vapors.

Figure 2. Galvanizing plant enclosure with ventilation ducts[8]



The following describes a typical galvanizing operation:[9]

> The new galvanizing operation forms a protective zinc coating on fabricated steel products. In the process, steel is first cleaned in a heated (approx. 160^0F) caustic bath made up mostly of caustic soda, then rinsed, next "pickled" in hydrochloric acid to remove rust, then rinsed again, dipped in a solution of zinc ammonium chloride (fluxing), then immersed in a bath of molten zinc which is maintained at approximately 840^0F. Galvanized products are then cooled by a water quench.

At a process rate of 6,000 lb/hr of galvanized steel, the plant detailed above uses 360 lb/hr of zinc. Air emissions include particulate matter from the molten zinc dip tank which is 68% ammonium chloride (NH_4Cl), 15.8% zinc oxide (ZnO) with the remaining 16.2% zinc metal, zinc chloride ($ZnCl_2$), carbon, ammonia (NH_3), water and oil.[9]

A separate, larger operation, with a process rate of 288,000 lb/hr of coated steel

[6] Source: Polymetal at http://www.polymetaal.nl/siteES/shopeswork/es/dept_130.html
[7] Kaßner, *op cit*, 6000 cubic meters of air per hour per square meter of treatment area [$m^3 (m^2 h)^{-1}$]
[8] Kaßner, *op cit*, Figure 6.2: Ventilation System
[9] Oklahoma Department of Environmental Quality, Air Quality Division Permit Application No. 93-127-O, Oklahoma Galvanizing Hot Dip Galvanizing Plant, Port of Catoosa, Rogers County, Oklahoma, June 16, 1996

using 20,000 lb/hr of zinc; was conducted inside a building 230 feet long, 70 feet wide, 30 feet high. The state permit quantified the emissions as follows: [10]

> Anticipated air emissions from the new facility will be natural gas combustion products from the molten zinc tank heater and particulate matter from the molten zinc dip tank. The particulate matter is expected to consist of 70% ammonium chloride (NH_4Cl), 20% zinc oxide (ZnO), with the balance as zinc metal and zinc chloride ($ZnCl_2$). Two baghouses, each with a capacity of 18,000 ACFM and a rated maximum grain exhaust of 0.02 gr/CF (approximate efficiency of 99.9%), will be installed on the process.

The unit described above employed a dual baghouse filtration system and was enclosed in a building to reduce air pollution and noise.

In between these two galvanizing plants in terms of size is the South Atlantic Galvanizing plant in Alamance County. This plant has a maximum process rate of 49,213 tons of galvanized steel per year with an annual zinc usage of 524.4 lb/hr and an annual ammonium chloride usage of 39,400 pounds (4.5 lb/h). According to data provided by the company to the NC Division of Air Quality, this plant's potential emission rate is 6,919 pounds of hydrogen chloride and 7,642 pounds of ammonia—both toxic air pollutants—from the cleaning and pickling processes alone. In addition, as much as 7,000 pounds of zinc and 22.4 pounds of lead are emitted by the galvanizing process. Also, 6,000 pounds of nitrogen oxides, 5,000 pounds of carbon monoxide and 1,231 pounds of hazardous air pollutants, can be emitted by the fossil fuel heating units.[11] South Atlantic is an open-air unit, it has no effective enclosure to limit ground level pollution, odor or noise.

Judged solely on the basis of the size of the operation, the South Atlantic Galvanizing plant is a Class IV industry within the meaning of the Alamance County Industrial Development Ordinance. Some states require far smaller units to obtain air pollution permits. The lack of an air permit means that a comprehensive industrial ordinance is the only means the county has to ensure the protection of public health and safety.

Contamination Detected Outside Galvanizing Plant Operation

In 2009 and 2011, residents living near the South Atlantic Galvanizing plant in Graham obtained laboratory analyses of samples collected in the vicinity of the plant. Table A summarizes the soil sample findings.

[10] Oklahoma State Department of Health Air Quality Service, Express Metal Fabricators Hot Dip Galvanizing Plant, Permit No. 91-134-C, Catoosa, Rogers County, Oklahoma, October 10, 1991
[11] North Carolina Division of Air Quality, Permit Applicability Determination, Emissions Estimate for Application No. 823: South Atlantic Galvanizing, July 6, 2006.

Table A. Soil Test Results

Sample	A	B	C	D	AA	BB	CC	DD	Typical US level in soil
Cadmium	1.0	2.3	8.6	8.0	3.6	1.6	2.5	1.6	0.06
Chromium	30.4	43.3	86.6	40.6	45.3	20.6	85.9	18.7	40
Lead	13.8	23.7	23.2	14.5	16.2	9.9	25.1	9.3	10
Zinc	84.9	181.0	30.1	258.0	167	149	193	209	50

All values in parts per million

All four heavy metals—cadmium, chromium, lead and zinc—are emitted from galvanizing plant operations. The steel galvanizing process employs caustic and acid baths for the application of zinc to steel. Cadmium, chromium and lead are contaminants in the process. Most of the soil test samples are above background levels, some by several orders of magnitude. Further data are available in a Blue Ridge Environmental Defense League technical report, available upon request.[12]

Heavy metals accumulate in organisms as a result of direct uptake from the surroundings from respiration and from ingestion. According to the US Environmental Protection Agency, soil contaminated with heavy metals can pose a public health risk, especially for children who might play, and inadvertently swallow it. If ingested in enough quantities, heavy metals can lead to a variety of serious health effects.[13] Atmospheric deposition of zinc, cadmium and lead on vegetables can elevate levels of these toxic elements causing risk to human health.[14] Heavy metals in groundwater and soil can contaminate edible vegetables, even when levels are within allowable standards.[15]

Conclusion

South Atlantic Galvanizing operates with virtually no pollution controls. Their tanks of hot metal, acid and caustic chemicals are open to the atmosphere. The contaminants of concern include airborne zinc, lead, cadmium, chromium, ammonia, acid and fine particles.

According to the US Environmental Protection Agency, soil contaminated with heavy metals can pose a public health risk, especially for children who play nearby and inadvertently swallow it. Soil tests reveal elevated levels of pollutants in the community

[12] Report: "Heavy Metals in the Vicinity of South Atlantic Galvanizing in Graham, North Carolina," A Blue Ridge Environmental Defense League Technical Report, Louis A. Zeller, January 8, 2010
[13] US Environmental Protection Agency Research & Development website at http://www.epa.gov/ord/sciencenews/scinews_contaminated-soil.html
[14] Sharma RK, "Heavy Metal (Cu, Zn, Cd and Pb) Contamination of Vegetables in Urban India," *Environmental Pollution,* vol. 154 issue 2, July 2008, pages 254-263
[15] Sharma RK, "Heavy Metal Contamination of Soil and Vegetables in Suburban Areas of Varanasi India, *Ecotoxicology and Environmental Safety*, vol. 66 issue 2, February 2007, pages 258-266

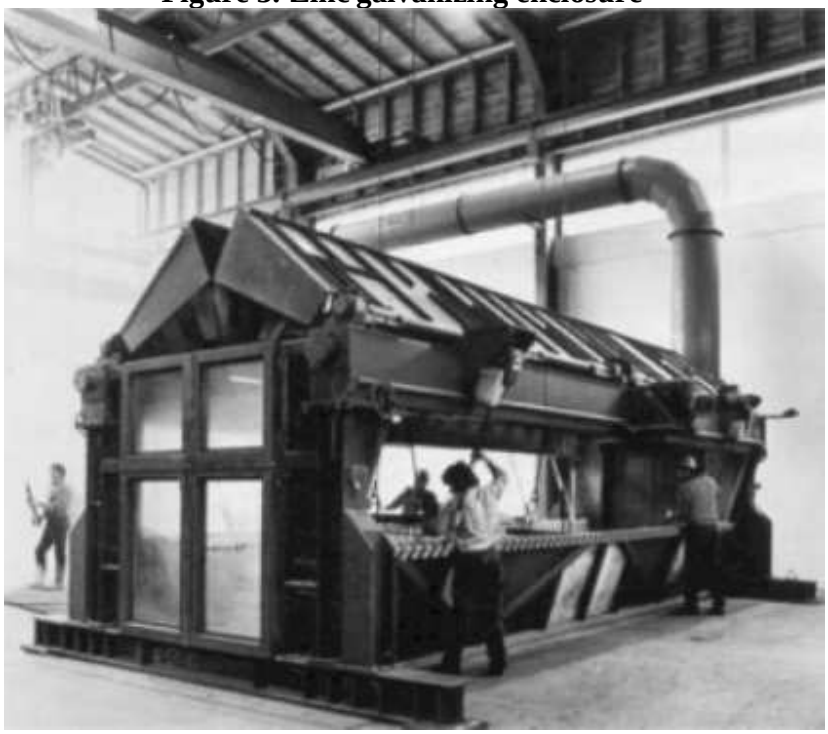
around South Atlantic, chemicals which are known to come from galvanizing operations. The soil levels of four toxic heavy metals are above normal.

For years South Atlantic's neighbors have catalogued adverse impacts including damaged and dying vegetation, nausea, respiratory distress and other health effects, and visible and noxious emissions. The Blue Ridge Environmental Defense League has requested that the Division of Air Quality require South Atlantic Galvanizing to obtain an air pollution permit.[16] So far, the DAQ has refused to do so.

Certainly, the most stringent measures of Heavy Industrial Development Ordinance Class IV are necessary for asphalt plants, landfills, cement manufacturing, metal recycling & salvage facilities and galvanizing facilities.

Finally, the ongoing failure of state environmental agencies to require permitting combined with the current budget-cutting fever in Raleigh spells trouble for Alamance County if it weakens existing protections. The set-backs of the current Polluting Industries Ordinance are conservative, effective, and enforceable means of protecting public health and safety. We recommend they remain in place.

Figure 3. Zinc galvanizing enclosure[17]



[16] Letter from Louis Zeller to Myron Whitley, Re: South Atlantic Galvanizing, July 24, 2006
[17] Kaßner, *op cit*, Figure 6.6 Zinc-kettle Housing