INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live.

Frank O'Bannon
Governor

Lori F. Kaplan
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
(317) 232-8603
(800) 451-6027
www.in.gov/idem

September 15, 2003

TO: Interested Parties / Applicant

RE: Dana Coupled Products / 183-18047-00015

FROM: Paul Dubenetzky
Chief, Permits Branch
Office of Air Quality

Notice of Decision: Approval - Registration

Please be advised that on behalf of the Commissioner of the Department of Environmental Management, I have issued a decision regarding the enclosed matter. Pursuant to IC 4-21.5-3-4(d) this order is effective when it is served. When served by U.S. mail, the order is effective three (3) calendar days from the mailing of this notice pursuant to IC 4-21.5-3-2(e).

If you wish to challenge this decision, IC 4-21.5-3-7 requires that you file a petition for administrative review. This petition may include a request for stay of effectiveness and must be submitted to the Office of Environmental Adjudication, ISTA Building, 150 W. Market Street, Suite 618, Indianapolis, IN 46204, **within eighteen (18) calendar days of the mailing of this notice**. The filing of a petition for administrative review is complete on the earliest of the following dates that apply to the filing:

(1) the date the document is delivered to the Office of Environmental Adjudication (OEA);
(2) the date of the postmark on the envelope containing the document, if the document is mailed to OEA by U.S. mail; or
(3) The date on which the document is deposited with a private carrier, as shown by receipt issued by the carrier, if the document is sent to the OEA by private carrier.

The petition must include facts demonstrating that you are either the applicant, a person aggrieved or adversely affected by the decision or otherwise entitled to review by law. Please identify the permit, decision, or other order for which you seek review by permit number, name of the applicant, location, date of this notice and all of the following:

(1) the name and address of the person making the request;
(2) the interest of the person making the request;
(3) identification of any persons represented by the person making the request;
(4) the reasons, with particularity, for the request;
(5) the issues, with particularity, proposed for considerations at any hearing; and
(6) identification of the terms and conditions which, in the judgment of the person making the request, would be appropriate in the case in question to satisfy the requirements of the law governing documents of the type issued by the Commissioner.

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178. Callers from within Indiana may call toll-free at 1-800-451-6027, ext. 3-0178.

Enclosures
FN-REGIS.dot 8/11/03

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September 15, 2003

Mr. John Clark
Dana Coupled Products
2651 South 600 East
Columbia City, IN 46725

Re: Registered Construction and Operation Status,
183-16870-00015, issued on April 3, 2003
Registration Revision 183-18047-00015

Dear Mr. Clark:

The application from Dana Coupled Products, received on August 12, 2003, has been reviewed. Based on the data submitted and the provisions in 326 IAC 2-5.5, it has been determined that the following emission units, to be located at 2651 South 600 East, Columbia City, Indiana, are classified as registered:

(1) One (1) natural gas-fired boiler, with a heat input capacity of 5.2 million British Thermal Units per hour (mmBtu/hr);

(2) One (1) natural gas-fired barrel line #2 dryer, with a heat input capacity of 1.0 mmBtu/hr;

(3) Two (2) natural gas-fired rack dryers, identified as #1 and #2, each has a heat input capacity of 0.8 mmBtu/hr;

(4) One (1) natural gas-fired open top wash station dryer, with a heat input capacity of 1.1 mmBtu/hr;

(5) One (1) natural gas-fired Bowden wash station dryer, with a heat input capacity of 1.1 mmBtu/hr;

(6) One (1) electric FMT wash station dryer;

(7) Three (3) natural gas-fired braze furnaces identified as #1, #5 and #6, each has a heat input capacity of 0.785 mmBtu/hr;

(8) Three (3) natural gas-fired braze furnaces, identified as #2, #3 each with heat input capacity of 0.614 mmBtu per hour, and #4 with a heat input capacity of 0.638 mmBtu/hr;

(9) One (1) natural gas-fired braze furnace, identified as #7, with a heat input capacity of 0.41 mmBtu/hr;

(10) Seven (7) natural gas-fired space heaters, identified as space heaters #1, #2, #3, #4, #5, #6, and #7, each has a heat input capacity of 0.132 mmBtu/hr;

(11) Six (6) natural gas-fired space heaters, identified as space heaters #8, #9, #10, #11, #12, and #13, each has a heat input capacity of 0.20 mmBtu/hr;

(12) Eight (8) natural gas-fired air make-up units, identified as make-up units #1, through #8, each has a heat input capacity of 0.001 mmBtu/hr;

(13) One large wall air make-up unit, with a capacity of 9.1 mmBtu/hr;

(14) Machining operation which consists of one (1) Hydromat machine, one (1) saw machines, one (1) CNC machine, one (1) Barker mill machine. Twenty (20) of the above mentioned machines are capable of machining 150 pounds per hour (lbs/hr) of brass metal. Thirty- three (33) of the above mentioned machines are capable of machining 50 lbs/hr of steel metal;

(15) One (1) deburring machine #1, identified as DBR #1, with a capacity of 225 lbs/hr;

(16) One (1) deburring machine #2, identified as DBR1-01, with a capacity of 150 lbs/hr;

(17) One (1) deburring machine #3, identified as Pine deburrer, with a capacity of 7 lbs/hr;

(18) One (1) deburring machine #4, identified as Quick Connect, with a capacity of 300 lbs/hr;

(19) Steel forming operation which consists of eleven (11) power steering end formers, thirty-six (36) hydraulic brake benders, and eleven (11) A/C end formers. This operation has a capacity of 100 lbs/hr of steel;

(20) Bending machines which consists of forty-six (46) power steering benders;

(21) Seven (7) power steering split die crimpers;

(22) Three (3) inliner machines;

(23) Eight (8) serators with a total capacity of 75 lbs/hr;

(24) Three (3) parts washers, rated at 1.8 gallons per hour, using caustic soda;

(25) Electroplating operation, which consists of barrel lines #1 and #2, rack lines #1 and #2. Barrel line #1 utilizes a soak clean, electro-clean, acid activator, nickel chloride, alkaline zinc, yellow iridescent/bronze chromate and rust inhibitor bath. Barrel line #2, rack line #1 and rack line #2 each utilizes a soak clean, electro-clean, acid activator, alkaline zinc/nickel sulfate, yellow iridescent/bronze chromate and rust inhibitor bath;

(26) Fifteen (15) small solvent parts washers;

(27) One (1) Belt Sander;

(28) Seven (7) electric lift trucks and four (4) propane lift trucks;

(29) Wastewater pretreatment operations;

(30) The following ancillary equipment:

(a) thirty-three (33) hydraulic brake benders

(b) three (3) auto tube stakers,

(c) seventeen (17) hydraulic tube stakers,

(d) seventeen (17) hydraulic tube stakers,

(e) eight (8) air operated tube stakers,

(f) three (3) A/C muffler assembly stakers,

(g) five (5) A/C punch presses,

(h) one (1) liquid turbo charger parts washer which utilizes a non-volatile solution,

(i) seven (7) spot welders,

(j) one (1) T drill machine,

(k) two (2) Novi tube cutters,

(l) two (2) Haven tube cutters,

(m) one (1) A/C rotary cutter,

(n) one (1) Grovo-Nelson hydraulic brake tube cutting machine,

(o) one (1) quick connect cell tube burnishing machine,

(p) one (1) washer/squasher punch press, and

(q) one (1) end form/tube end punch.

(31) Two (2) braze furnaces identified as Braze Furnace # 1 and Braze Furnace #8, each with maximum heat input capacity of 0.5 mmBtu/hr;

(32) Four (4) deburring machines identified as Deburring Machine #5, #6, #7, and #8, each with a maximum capacity of 450 pounds per hour;

(33) One (1) Haven tube cutter;

(34) One (1) Crown tube cutter;

(35) One (1) Radyne Quality Control Tester;

(36) One (1) air pressure tester #6;

(37) Two (2) end formers;

(38) Six (6) inline machines;

(39) Fifteen (15) auto tube staker;

(40) One (1) Dickey machine, #7;

(41) Two (2) spot welders;

(42) Two (2) Novi tube cutters;

(43) Eight (8) power steering end former machines;

(44) Three (3) form tool machines, identified as #1, #2, and #3;

(45) One (1) Roll Grove machine identified as #1.

(46) Three (3) barrel lines, identified as Barrel Lines #3, #4 and #5, with a maximum capacity of 825 pounds of steel parts per hour, each, each including:

(a) One (1) soak-clean bath, capacity: 0.75 gallons per hour per line;

(b) One (1) acid activator process, capacity: 1.70 gallons per hour per line;

(c) One (1) electro-clean bath, capacity: 0.64 gallons per hour per line;

(d) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.34 gallons per hour per line and 2,137 amp hours per line;

(e) Two (2) trivalent, decorative chromium electroplating baths, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 0.46 gallons per hour per line;

(f) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour per line;

(g) One (1) steam powered dryer; and

(h) Water rinse tanks.

(47) One (1) rack line, identified as Rack Line #3, with a maximum capacity of 825 pounds of steel parts per hour, including:

(a) One (1) soak-clean bath, capacity: 0.16 gallons per hour;

(b) One (1) acid activator process, capacity: 2.86 gallons per hour;

(c) One (1) electro-clean bath, capacity: 0.16 gallons per hour;

(d) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.52 gallons per hour and 2,137 amp hours;

(e) One (1) trivalent, decorative chromium electroplating bath, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 1.07 gallon per hour;

(f) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour;

(g) One (1) steam powered dryer; and

(h) Water rinse tanks.

The following conditions shall be applicable:

(1) Pursuant to 326 IAC 5-1-2 (Opacity Limitations) except as provided in 326 IAC 5-1-3 (Temporary Exemptions), opacity shall meet the following:

(a) Opacity shall not exceed an average of forty percent (40%) in any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of 15 minutes (60 readings) in a 6-hour period as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor in a six (6) hour period.

(2) Pursuant to 326 IAC 6-2-4 (PM Emissions from Sources of Indirect Heating), PM emissions from the 5.2 mmBtu/hr boiler is limited to 0.6 lb/mmBtu.

(3) Pursuant to 326 IAC 8-3-2, the owner or operator of the solvent small parts washers # 1 through 15 shall:

(a) equip the cleaner with a cover;

(b) equip the cleaner with a facility for draining cleaned parts;

(c) close the degreaser cover whenever parts are not being handled in the cleaner;

(d) drain cleaned parts for at least fifteen (15) seconds or until dripping ceases;

(e) provide a permanent, conspicuous label summarizing the operating requirements;

(f) store waste solvent only in covered containers and not dispose of waste solvent or transfer it to another party, in such a manner that greater than twenty percent (20%) of the waste solvent (by weight) can evaporate into the atmosphere.

(4) Pursuant to 326 IAC 8-3-5:

(a) the owner or operator of cold cleaner degreaser facilities # 1 through 15 shall ensure that the following control equipment requirements are met:

(1) Equip the degreaser with a cover. The cover must be designed so that it can be easily operated with one (1) hand if:

(A) the solvent volatility is greater than two (2) kiloPascals (fifteen (15) millimeters of mercury or three-tenths (0.3) pounds per square inch) measured at thirty-eight degrees Celsius (38EC) (one hundred degrees Fahrenheit (100EF));

(B) the solvent is agitated; or

(C) the solvent is heated.

(2) Equip the degreaser with a facility for draining cleaned articles. If the solvent volatility is greater than four and three-tenths (4.3) kiloPascals (thirty-two (32) millimeters of mercury or six-tenths (0.6) pounds per square inch) measured at thirty-eight degrees Celsius (38EC) (one hundred degrees Fahrenheit (100EF)), then the drainage facility must be internal such that articles are enclosed under the cover while draining. The drainage facility may be external for applications where an internal type cannot fit into the cleaning system.

(3) Provide a permanent, conspicuous label which lists the operating requirements outlined in subsection (b).

(4) The solvent spray, if used, must be a solid, fluid stream and shall be applied at a pressure which does not cause excessive splashing.

(5) Equip the degreaser with one (1) of the following control devices if the solvent volatility is greater than four and three-tenths (4.3) kiloPascals (thirty-two (32) millimeters of mercury or six-tenths (0.6) pounds per square inch) measured at thirty-eight degrees Celsius (38EC) (one hundred degrees Fahrenheit (100EF)), or if the solvent is heated to a temperature greater than forty-eight and nine-tenths degrees Celsius (48.9EC) (one hundred twenty degrees Fahrenheit (120EF)):

(A) A freeboard that attains a freeboard ratio of seventy-five hundredths (0.75) or greater.

(B) A water cover when solvent used is insoluble in, and heavier than, water.

(C) Other systems of demonstrated equivalent control such as a refrigerated chiller or carbon adsorption. Such systems shall be submitted to the U.S. EPA as a SIP revision.

(b) the owner or operator of a cold cleaning facility shall ensure that the following operating requirements are met:

(1) Close the cover whenever articles are not being handled in the degreaser.

(2) Drain cleaned articles for at least fifteen (15) seconds or until dripping ceases.

(3) Store waste solvent only in covered containers and prohibit the disposal or transfer of waste solvent in any manner in which greater than twenty percent (20%) of the waste solvent by weight could evaporate.

(5) The provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1-1, apply to the trivalent, decorative chromium electroplating baths except when otherwise specified in 40 CFR Part 63, Subpart N.

(6) The provisions of 40 CFR 63, Subpart N - National Emission Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks, which are incorporated by reference as 326 IAC 20-8-1, apply to the trivalent, decorative chromium electroplating baths. A copy of this rule is attached.

(7) Chromium Emissions Limitation [40 CFR 63.342(e)] [326 IAC 20-8]

(a) The emission limitations in this condition apply only during tank operation, and also apply during periods of startup and shutdown as these are routine occurrences for tanks subject to 326 IAC 20-8-1. The emission limitations do not apply during periods of malfunction.

(b) These decorative chromium electroplating baths that use trivalent chromium baths that incorporate a wetting agent as a bath ingredient are subject to 40 CFR 63.342(e).

(8) The Permittee shall maintain records to document compliance with Condition (7). These records shall include a minimum of the following:

(a) Records of the bath components purchased, with the wetting agent clearly identified as a bath constituent contained in one of the components.

(b) All documentation supporting the notifications and reports required by 40 CFR 63.9 and 63.10 (Subpart A, General Provisions) and by Condition (9).

(9) Pursuant to 40 CFR 63.347(i), the Permittee must submit the following reports:

(a) An initial notification that includes:

(1) A notification of the actual dates when construction of the trivalent, decorative chromium electroplating baths commenced shall be submitted no later than thirty (30) days after such dates.

(2) A notification of the actual date of startup of the trivalent, decorative chromium electroplating baths shall be submitted within thirty (30) days after such date;

(3) A statement that a trivalent chromium process that incorporates a wetting agent will be used to comply with § 63.342(e); and

(4) The list of bath components that comprise the trivalent chromium bath, with the wetting agent clearly identified.

(b) Within 30 days after the start-up date, a notification of compliance status that contains an update of the information submitted in the initial notification or a statement that the information is still accurate.

(c) Within 30 days of a change to the trivalent chromium electroplating process, a report that includes:

(1) A description of the manner in which the process has been changed and the emission limitation, if any, now applicable to the affected source;

(2) If a different emission limitation applies, the applicable information required by 40 CFR 63.347 (c)(1); and

(3) The notification and reporting requirements of 40 CFR 63.347 (d), (e), (f), (g), and (h) of this section, which shall be submitted in accordance with the schedules identified in those paragraphs.

(d) Reports required by this condition shall be submitted to:

Indiana Department of Environmental Management
Compliance Branch, Office of Air Quality
Chromium Electroplating
100 North Senate Avenue, P.O. Box 6015
Indianapolis, Indiana 46206

(10) Pursuant to 326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes), the allowable particulate emission rate from the zinc/nickel sulfate electroplating baths shall not exceed 2.27 pounds per hour, each, when operating at the maximum process weight rate of 825 pounds per hour, each.

The pounds per hour limitation was calculated with the following equation:

Interpolation of the data for the process weight rate up to 60,000 pounds per hour shall be accomplished by use of the equation:

$E = 4.10\ P^{0.67}$ where E = rate of emission in pounds per hour; and
P = process weight rate in tons per hour

An authorized individual shall provide an annual notice to the Office of Air Quality that the source is in operation and in compliance with this registration pursuant to 326 IAC 2-5.1-2(f)(3) and 326 IAC 2-5.5-4(a)(3). The annual notice shall be submitted to:

Compliance Data Section
Office of Air Quality
100 North Senate Avenue
P.O. Box 6015
Indianapolis, IN 46206-6015

no later than March 1 of each year, with the annual notice being submitted in the format attached.

An application or notification shall be submitted in accordance with 326 IAC 2 to the Office of Air Quality (OAQ) if the source proposes to construct new emission units, modify existing emission units, or otherwise modify the source.

Sincerely,

Original signed by Paul Dubenetzky
Paul Dubenetzky, Chief
Permits Branch
Office of Air Quality

CAP/MES

cc: File - Whitley County
Whitley County Health Department
Air Compliance -Ryan Hillman
Permit Tracking
Technical Support and Modeling - Michele Boner
Compliance Data Section - Karen Nowak

Indiana Department of Environmental Management
Office of Air Quality

Technical Support Document (TSD) for a Revised Registration

Source Background and Description

Source Name:	**Dana Coupled Products**
Source Location:	**2651 South 600 East, Columbia City, Indiana 46725**
County:	**Whitley**
SIC Code:	**3714**
Registration No.:	**R 183-16870-00015**
Registration Issuance Date:	**April 3, 2003**
Registration Revision No.:	**RR 183-18047-00015**
Permit Reviewer:	**CarrieAnn Paukowits**

The Office of Air Quality (OAQ) has reviewed a revision application from Dana Coupled Products relating to the construction and operation of the following emission units and pollution control devices:

(a) Three (3) barrel lines, identified as Barrel Lines #3, #4 and #5, with a maximum capacity of 825 pounds of steel parts per hour, each, each including:

(1) One (1) soak-clean bath, capacity: 0.75 gallons per hour per line;

(2) One (1) acid activator process, capacity: 1.70 gallons per hour per line;

(3) One (1) electro-clean bath, capacity: 0.64 gallons per hour per line;

(4) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.34 gallons per hour per line and 2,137 amp hours per line;

(5) Two (2) trivalent, decorative chromium electroplating baths, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 0.46 gallons per hour per line;

(6) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour per line;

(7) One (1) steam powered dryer; and

(8) Water rinse tanks.

(b) One (1) rack line, identified as Rack Line #3, with a maximum capacity of 825 pounds of steel parts per hour, including:

(1) One (1) soak-clean bath, capacity: 0.16 gallons per hour;

(2) One (1) acid activator process, capacity: 2.86 gallons per hour;

(3) One (1) electro-clean bath, capacity: 0.16 gallons per hour;

(4) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.52 gallons per hour and 2,137 amp hours;

(5) One (1) trivalent, decorative chromium electroplating bath, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 1.07 gallon per hour;

(6) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour;

(7) One (1) steam powered dryer; and

(8) Water rinse tanks.

History

On August 12, 2003, Dana Coupled Products submitted an application to the OAQ requesting to add four (4) new trivalent chromium and zinc/nickel electroplating lines to their existing plant. Dana Coupled Products was issued Registration 183-14330 on August 1, 2001. Re-Registrations 183-15348 and 183-16870 were issued on July 3, 2002, and April 3, 2003, respectively.

Enforcement Issue

There are no enforcement actions pending.

Stack Summary

Stack ID	Operation	Height (feet)	Diameter (feet)	Flow Rate (acfm)	Temperature (EF)
Scrubber R1	Barrel Lines #3 and #5	39.0	2.67	26,000	ambient
Scrubber R2b	Barrel Line #4	28.0	2.67	16,000	ambient
Scrubber R2a	Rack Line #3	28.0	2.67	16,000	ambient

Recommendation

The staff recommends to the Commissioner that the Revised Registration be approved. This recommendation is based on the following facts and conditions:

Unless otherwise stated, information used in this review was derived from the application and additional information submitted by the applicant.

An application for the purposes of this review was received on August 12, 2003. Additional information was received on August 25, 2003.

Emission Calculations

The soak clean, rust inhibitor, electro-clean, and acid activator do not contain VOC, NO_X or SO_2. The soak clean, rust inhibitor and electo-clean are aqueous solutions that do not contain hazardous air pollutants. The acid activator contains HCl that may be evaporated. See pages 1 and 2 of 2 of Appendix A of this document for detailed emissions calculations for the electroplating operations and acid activator.

Potential To Emit of Revision

Pursuant to 326 IAC 2-1.1-1(16), Potential to Emit is defined as "the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the U.S. EPA."

This table reflects the PTE before controls for this revision. Control equipment is not considered federally enforceable until it has been required in a federally enforceable permit.

Pollutant	Potential To Emit (tons/year)
PM	3.38
PM_{10}	3.38
SO_2	0.00
VOC	0.00
CO	0.00
NO_X	4.23

HAPs	Potential To Emit (tons/year)
Hydrochloric Acid (HCl)	8.66
Chromium	0.003
Nickel	3.37
TOTAL	12.0

Justification for Revision

The Registration is being revised through a Registration Revision request. This revision is being performed pursuant to 326 IAC 2-5.5-6(h).

County Attainment Status

The source is located in Whitley County.

Pollutant	Status
PM_{10}	attainment
SO_2	attainment
NO_2	attainment
Ozone	attainment
CO	attainment
Lead	attainment

(a) Volatile organic compounds (VOC) are precursors for the formation of ozone. Therefore, VOC emissions are considered when evaluating the rule applicability relating to the ozone standards. Whitley County has been designated as attainment or unclassifiable for ozone. Therefore, VOC emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(b) Whitley County has been classified as attainment or unclassifiable for all remaining criteria pollutants. Therefore, these emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(c) Fugitive Emissions

Since this type of operation is not one of the 28 listed source categories under 326 IAC 2-2 and since there are no applicable New Source Performance Standards that were in effect on August 7, 1980, the fugitive emissions are not counted toward determination of PSD and Emission Offset applicability.

Source Status

Existing Source PSD or Emission Offset Definition (emissions after controls, based upon 8760 hours of operation per year at rated capacity and/or as otherwise limited):

Pollutant	**Before Revision Emissions** (tons/year)	**After Revision Emissions** (tons/year)
PM	7.33	10.7
PM_{10}	7.33	10.7
SO_2	0.08	0.08
VOC	3.13	3.13
CO	9.60	9.60
NO_X	11.1	15.3
Nickel	3.03	6.40
Chromium	0.00	0.003
HCl	0.00	8.66
Total HAPs	3.03	12.0

(a) This existing source, after this revision, has the potential to emit less than Minor Source Operating Permit (MSOP) thresholds. Therefore, this source shall remain a Registered source.

(b) Although this modification consists of the addition of chromium electroplating, this modification will not subject the source to 326 IAC 2-6.1-3(a), Minor Source Operating Permit, because pursuant to 326 IAC 2-5.1-3, sources consisting only of decorative chromium electroplating tanks that use a trivalent chromium process that incorporates a wetting agent that are subject to section 2 of this rule are not included in the requirement to obtain a Minor

Source Operating Permit.

(c) The "Before Revision Emissions" are based on the table on page 5 of 9 of the TSD for Re-Registration 183-16870, issued on April 3, 2003.

Federal Rule Applicability

(a) There are no New Source Performance Standards (NSPS) (326 IAC 12 and 40 CFR Part 60) applicable to this proposed revision.

(b) The seven (7) chromium electroplating baths, exhausting through three (3) scrubbers, are subject to the National Emission Standards for Hazardous Air Pollutants, 326 IAC 20, (40 CFR 63, Subpart N, and 326 IAC 20-8-1). Pursuant to 40 CFR 63, Subpart N, and 326 IAC 20-8-1, the chromium electroplating operations are subject to the following conditions:

(1) The provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1-1, apply to the trivalent, decorative chromium electroplating baths except when otherwise specified in 40 CFR Part 63, Subpart N.

(2) Chromium Emissions Limitation

These decorative chromium electroplating baths that use trivalent chromium baths that incorporate a wetting agent as a bath ingredient are subject to 40 CFR 63.342(e).

(3) Record keeping, including a minimum of the following:

(A) Records of the bath components purchased, with the wetting agent clearly identified as a bath constituent contained in one of the components.

(B) All documentation supporting the notifications and reports required by 40 CFR 63.9 and 63.10 (Subpart A, General Provisions).

(4) Pursuant to 40 CFR 63.347(i), the Permittee must submit the following reports:

(A) An initial notification that includes:

(i) A notification of the actual dates when construction of the trivalent, decorative chromium electroplating baths commenced shall be submitted no later than thirty (30) days after such dates.

(ii) A notification of the actual date of startup of the trivalent, decorative chromium electroplating baths shall be submitted within thirty (30) days after such date;

(iii) A statement that a trivalent chromium process that incorporates a wetting agent will be used to comply with § 63.342(e); and

(iv) The list of bath components that comprise the trivalent chromium bath, with the wetting agent clearly identified.

(B) Within 30 days after the start-up date, a notification of compliance status that contains an update of the information submitted in the initial notification or a statement that the information is still accurate.

(C) Within 30 days of a change to the trivalent chromium electroplating process, a report that includes:

(i) A description of the manner in which the process has been changed and the emission limitation, if any, now applicable to the affected source;

(ii) If a different emission limitation applies, the applicable information required by 40 CFR 63.347 (c)(1); and

(iii) The notification and reporting requirements of 40 CFR 63.347 (d), (e), (f), (g), and (h) of this section, which shall be submitted in accordance with the schedules identified in those paragraphs.

(D) Reports shall be submitted to:

Indiana Department of Environmental Management
Compliance Branch, Office of Air Quality
Chromium Electroplating
100 North Senate Avenue, P.O. Box 6015
Indianapolis, Indiana 46206

State Rule Applicability - Individual Facilities

326 IAC 2-4.1-1 (New Source Toxics Control)

This source will still emit levels of air toxics less than those which constitute a major source according to Section 112 of the 1990 Clean Air Act Amendments. Therefore, the requirements of 326 IAC 2-4.1-1, New Source Toxics Control, are not applicable.

326 IAC 6-3 (Particulate Emission Limitations for Manufacturing Processes)

(a) Pursuant to 326 IAC 6-3-1(c)(6), this rule is not applicable to the chromium electroplating operations because a particulate limit for the electroplating is established in 326 IAC 20-8-1.

(b) Pursuant to 326 IAC 6-3-2, the particulate matter (PM) from the zinc/nickel sulfate electroplating baths shall not exceed 2.27 pounds per hour, each, when operating at the maximum process weight rate of 825 pounds per hour, each. Since the potential to emit from the total of all zinc/nickel sulfate electroplating operations is 0.769 pounds per hour, the zinc/nickel sulfate electroplating operations will comply with this rule. This limitation is based upon the following:

Interpolation of the data for the process weight rate up to sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$E = 4.10\ P^{0.67}$ where E = rate of emission in pounds per hour and
P = process weight rate in tons per hour

326 IAC 20-1-1 (Incorporation of federal regulations)

The chromium electroplating operations, subject to 326 IAC 20-8, are required to comply with the requirements of 40 CFR 63, Subpart A, concerning general provisions for emission standards for hazardous air pollutants.

326 IAC 20-8 (Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks)

The chromium electroplating operations are required to comply with the requirements of 40 CFR 63, Subpart N, National Emission Standards for Chromium Emissions from Hard and Decorative Electroplating and Anodizing Tanks, as described in the "Federal Rule Applicability" section of this TSD.

Proposed Changes

The Registration letter language is changed to read as follows (deleted language appears as ~~strikeouts~~, new language appears in **bold**):

The equipment classified as registered is revised as follows:

(1) One (1) natural gas-fired boiler, with a heat input capacity of 5.2 million British Thermal Units per hour (mmBtu/hr);

(2) One (1) natural gas-fired barrel line #2 dryer, with a heat input capacity of 1.0 mmBtu/hr;

(3) Two (2) natural gas-fired rack dryers, identified as #1 and #2, each has a heat input capacity of 0.8 mmBtu/hr;

(4) One (1) natural gas-fired open top wash station dryer, with a heat input capacity of 1.1 mmBtu/hr;

(5) One (1) natural gas-fired Bowden wash station dryer, with a heat input capacity of 1.1 mmBtu/hr;

(6) One (1) electric FMT wash station dryer;

(7) Three (3) natural gas-fired braze furnaces identified as #1, #5 and #6, each has a heat input capacity of 0.785 mmBtu/hr;

(8) Three (3) natural gas-fired braze furnaces, identified as #2, #3 each with heat input capacity of 0.614 mmBtu per hour, and #4 with a heat input capacity of 0.638 mmBtu/hr;

(9) One (1) natural gas-fired braze furnace, identified as #7, with a heat input capacity of 0.41 mmBtu/hr;

(10) Seven (7) natural gas-fired space heaters, identified as space heaters #1, #2, #3, #4, #5, #6, and #7, each has a heat input capacity of 0.132 mmBtu/hr;

(11) Six (6) natural gas-fired space heaters, identified as space heaters #8, #9, #10, #11, #12, and #13, each has a heat input capacity of 0.20 mmBtu/hr;

(12) Eight (8) natural gas-fired air make-up units, identified as make-up units #1, through #8, each has a heat input capacity of 0.001 mmBtu/hr;

(13) One large wall air make-up unit, with a capacity of 9.1 mmBtu/hr;

(14) Machining operation which consists of one (1) Hydromat machine, one (1) saw machines, one (1) CNC machine, one (1) Barker mill machine. Twenty (20) of the above mentioned machines are capable of machining 150 pounds per hour (lbs/hr) of brass metal. Thirty-three (33) of the above mentioned machines are capable of machining 50 lbs/hr of steel metal;

(15) One (1) deburring machine #1, identified as DBR #1, with a capacity of 225 lbs/hr;

(16) One (1) deburring machine #2, identified as DBR1-01, with a capacity of 150 lbs/hr;

(17) One (1) deburring machine #3, identified as Pine deburrer, with a capacity of 7 lbs/hr;

(18) One (1) deburring machine #4, identified as Quick Connect, with a capacity of 300 lbs/hr;

(19) Steel forming operation which consists of eleven (11) power steering end formers, thirty-six (36) hydraulic brake benders, and eleven (11) A/C end formers. This operation has a capacity of 100 lbs/hr of steel;

(20) Bending machines which consists of forty-six (46) power steering benders;

(21) Seven (7) power steering split die crimpers;

(22) Three (3) inliner machines;

(23) Eight (8) serators with a total capacity of 75 lbs/hr;

(24) Three (3) parts washers, rated at 1.8 gallons per hour, using caustic soda;

(25) Electroplating operation, which consists of barrel lines #1 and #2, rack lines #1 and #2. Barrel line #1 utilizes a soak clean, electro-clean, acid activator, nickel chloride, alkaline zinc, yellow iridescent/bronze chromate and rust inhibitor bath. Barrel line #2, rack line #1 and rack line #2 each utilizes a soak clean, electro-clean, acid activator, alkaline zinc/nickel sulfate, yellow iridescent/bronze chromate and rust inhibitor bath;

(26) Fifteen (15) small solvent parts washers;

(27) One (1) Belt Sander;

(28) Seven (7) electric lift trucks and four (4) propane lift trucks;

(29) Wastewater pretreatment operations;

(30) The following ancillary equipment:
- (b) thirty-three (33) hydraulic brake benders
- (c) three (3) auto tube stakers,
- (d) seventeen (17) hydraulic tube stakers,
- (e) seventeen (17) hydraulic tube stakers,
- (f) eight (8) air operated tube stakers,
- (g) three (3) A/C muffler assembly stakers,
- (h) five (5) A/C punch presses,
- (i) one (1) liquid turbo charger parts washer which utilizes a non-volatile solution,

(j) seven (7) spot welders,
(k) one (1) T drill machine,
(l) two (2) Novi tube cutters,
(m) two (2) Haven tube cutters,
(n) one (1) A/C rotary cutter,
(o) one (1) Grovo-Nelson hydraulic brake tube cutting machine,
(p) one (1) quick connect cell tube burnishing machine,
(q) one (1) washer/squasher punch press, and
(r) one (1) end form/tube end punch.

(31) Two (2) braze furnaces identified as Braze Furnace # 1 and Braze Furnace #8, each with maximum heat input capacity of 0.5 mmBtu/hr;

(32) Four (4) deburring machines identified as Deburring Machine #5, #6, #7, and #8, each with a maximum capacity of 450 pounds per hour;

(33) One (1) Haven tube cutter;

(34) One (1) Crown tube cutter;

(35) One (1) Radyne Quality Control Tester;

(36) One (1) air pressure tester #6;

(37) Two (2) end formers;

(38) Six (6) inline machines;

(39) Fifteen (15) auto tube staker;

(40) One (1) Dickey machine, #7;

(41) Two (2) spot welders;

(42) Two (2) Novi tube cutters;

(43) Eight (8) power steering end former machines;

(44) Three (3) form tool machines, identified as #1, #2, and #3;

(45) One (1) Roll Grove machine identified as #1.

(46) Three (3) barrel lines, identified as Barrel Lines #3, #4 and #5, with a maximum capacity of 825 pounds of steel parts per hour, each, each including:

(a) One (1) soak-clean bath, capacity: 0.75 gallons per hour per line;

(b) One (1) acid activator process, capacity: 1.70 gallons per hour per line;

(c) One (1) electro-clean bath, capacity: 0.64 gallons per hour per line;

(d) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.34 gallons per hour per line and 2,137 amp hours per line;

(e) Two (2) trivalent, decorative chromium electroplating baths, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 0.46 gallons per hour per line;

(f) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour per line;

(g) One (1) steam powered dryer; and

(h) Water rinse tanks.

(47) One (1) rack line, identified as Rack Line #3, with a maximum capacity of 825 pounds of steel parts per hour, including:

(a) One (1) soak-clean bath, capacity: 0.16 gallons per hour;

(b) One (1) acid activator process, capacity: 2.86 gallons per hour;

(c) One (1) electro-clean bath, capacity: 0.16 gallons per hour;

(d) One (1) zinc/nickel sulfate electroplating bath, capacity: 0.52 gallons per hour and 2,137 amp hours;

(e) One (1) trivalent, decorative chromium electroplating bath, utilizing an wetting agent as control and a wet scrubber which is optional, capacity: 1.07 gallon per hour;

(f) One (1) rust inhibitor bath, capacity: 0.022 gallons per hour;

(g) One (1) steam powered dryer; and

(h) Water rinse tanks.

The following changes have been made to the Registration:

(5) The provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1-1, apply to the trivalent, decorative chromium electroplating baths except when otherwise specified in 40 CFR Part 63, Subpart N.

(6) The provisions of 40 CFR 63, Subpart N - National Emission Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks, which are incorporated by reference as 326 IAC 20-8-1, apply to the trivalent, decorative chromium electroplating baths. A copy of this rule is attached.

(7) Chromium Emissions Limitation [40 CFR 63.342(e)] [326 IAC 20-8]

(a) The emission limitations in this condition apply only during tank operation, and also apply during periods of startup and shutdown as these are routine occurrences for tanks subject to 326 IAC 20-8-1. The emission limitations do not apply during periods of malfunction.

(b) These decorative chromium electroplating baths that use trivalent chromium baths that incorporate a wetting agent as a bath ingredient are subject to 40 CFR 63.342(e).

(8) The Permittee shall maintain records to document compliance with Condition (7). These records shall include a minimum of the following:

(a) Records of the bath components purchased, with the wetting agent clearly identified as a bath constituent contained in one of the components.

(b) All documentation supporting the notifications and reports required by 40 CFR 63.9 and 63.10 (Subpart A, General Provisions) and by Condition (9).

(9) Pursuant to 40 CFR 63.347(i), the Permittee must submit the following reports:

(a) An initial notification that includes:

(1) A notification of the actual dates when construction of the trivalent, decorative chromium electroplating baths commenced shall be submitted no later than thirty (30) days after such dates.

(2) A notification of the actual date of startup of the trivalent, decorative chromium electroplating baths shall be submitted within thirty (30) days after such date;

(3) A statement that a trivalent chromium process that incorporates a wetting agent will be used to comply with § 63.342(e); and

(4) The list of bath components that comprise the trivalent chromium bath, with the wetting agent clearly identified.

(b) Within 30 days after the start-up date, a notification of compliance status that contains an update of the information submitted in the initial notification or a statement that the information is still accurate.

(c) Within 30 days of a change to the trivalent chromium electroplating process, a report that includes:

(1) A description of the manner in which the process has been changed and the emission limitation, if any, now applicable to the affected source;

(2) If a different emission limitation applies, the applicable information required by 40 CFR 63.347 (c)(1); and

(3) The notification and reporting requirements of 40 CFR 63.347 (d), (e), (f), (g), and (h) of this section, which shall be submitted in accordance with the schedules identified in those paragraphs.

(d) Reports required by this condition shall be submitted to:

**Indiana Department of Environmental Management
Compliance Branch, Office of Air Quality
Chromium Electroplating
100 North Senate Avenue, P.O. Box 6015
Indianapolis, Indiana 46206**

(10) Pursuant to 326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes), the allowable particulate emission rate from the zinc/nickel sulfate electroplating baths shall not exceed 2.27 pounds per hour, each, when operating at the maximum process weight rate of 825 pounds per hour, each.

The pounds per hour limitation was calculated with the following equation:

Interpolation of the data for the process weight rate up to 60,000 pounds per hour shall be accomplished by use of the equation:

$$E = 4.10\ P^{0.67}$$

where E = rate of emission in pounds per hour; and
P = process weight rate in tons per hour

~~This registration is a re-registration issued to this source. The source may operate according to 326 IAC 2-5.5.~~

An authorized individual shall provide an annual notice to the Office of Air Quality that the source is in operation and in compliance with this registration pursuant to **326 IAC 2-5.1-2(f)(3) and** 326 IAC 2-5.5-4(a)(3).

Conclusion

The construction and operation of this proposed revision shall be subject to the conditions of the attached proposed Revised Registration No. **183-18047-00015.**

Appendix A: Emission Calculations
HCl Emissions

Company Name: **Dana Coupled Products**
Address City IN Zip: **2651 South 600 East, Columbus City, IN 46725**
Registration Revision: **183-18047**
Plt ID: **183-00015**
Reviewer: **CarrieAnn Paukowits**
Date: **August 12, 2003**

Zinc/Nickel Sulfate Electroplating

Capacity per Line (Amp-hr)	Number of Lines	PM and PM-10 Emission Factor (gr/Amp-hr)	Nickel Emission Factor (gr/Amp-hr)	PM and PM-10 Potential to Emit (tons/yr)	Nickel Potential to Emit (tons/yr)
2,137	4	0.63	0.63	3.37	3.37

Trivalent Chromium Electroplating

Scrubber	Air Flow Rate (cfm)	Lines	PM and PM-10 Emission Factor (gr/dscf)	Chromium Emission Factor (gr/dscf)	PM and PM-10 Potential to Emit (tons/yr)	Chromium Potential to Emit (tons/yr)
R1	16,000	Barrel Lines #3 and #5	2.50E-06	1.20E-06	0.002	0.001
R2b	16,000	Barrel Line #4	2.50E-06	1.20E-06	0.002	0.001
R2a	26,000	Rack Line #3	2.50E-06	1.20E-06	0.002	0.001
				Total:	**0.005**	**0.003**

Nox Emissions from Chromium Electroplating

Chemical Addition Rate (gallons/hr)	Density (lbs/gal)	Weight % Nitric Acid in chemical	Weight % Chemical in Solution	Nox Potential to Emit (tons/yr)
2.45	10.1	0.13	0.3	4.23

Totals	**PM**	**PM-10**	**Nox**	**Chromium**	**Nickel**	**Total HAPs**
tons/yr	**3.38**	**3.38**	**4.23**	**0.003**	**3.37**	**3.37**

Methodology

Emission Factors from AP-42, Chapter 12.20, Tables 1 and 4
For Zinc/Nickel electroplating,
PM and PM-10 Potential to Emit (tons/yr) = Capacity per Line (Amp-hr) x Number of Lines x PM and PM-10 Emission Factor (gr/Amp-hr) x 1lb/7,000 gr x 1lb/2,000 tons x 8,760 hrs/yr
Worst case Nickel Emission Factor = PM Emission Factor
Nickel Potential to Emit (tons/yr) = Capacity per Line (Amp-hr) x Number of Lines x Nickel Emission Factor (gr/Amp-hr) x 1lb/7,000 gr x 1lb/2,000 tons x 8,760 hrs/yr
For Chromium electroplating,
PM and PM-10 Potential to Emit (tons/yr) = Air Flow Rate (cfm) x PM and PM-10 Emission Factor (gr/dscf) x 60 min/hr x 1lb/7,000 gr x 1lb/2,000 tons x 8,760 hrs/yr
Chromium Potential to Emit (tons/yr) = Air Flow Rate (cfm) x Chromium Emission Factor (gr/dscf) x 60 min/hr x 1lb/7,000 gr x 1lb/2,000 tons x 8,760 hrs/yr
Nox emissions from chromium electroplating were calculated by the applicant, and are conservative since not all Nitric Acid will be emitted and not all will be emitted as Nox
Nox Potential to Emit (tons/yr) = Chemical Addition Rate (gallons/hr) x Density (lbs/gal) x Weight % Nitric Acid in chemical x Weight % chemical in solution x 8,760 hrs/yr x 1lb/2,000tons

Appendix A: Emission Calculations
HCl Emissions

Company Name: Dana Coupled Products
Address City IN Zip: 2651 South 600 East, Columbus City, IN 46725
Registration Revision: 183-18047
Plt ID: 183-00015
Reviewer: CarrieAnn Paukowits
Date: August 12, 2003

ESTIMATION OF HCl LOSSES FROM ACID ACTIVATION PROCESSES

Open Tanks

Barrel Line #3

INPUT DATA			RESULTS			
Item	Units	Quantity	Item	Units	Quantity	Quantity
HCl in acid	% w/v	21.4			HCl	Water
Fe in acid	% w/v	0	Surface loss	lb/h/sqft	0.030	0.101
Temperature	deg F	68	Total loss	lb/h	0.717	2.422
Exhaust rate	cfm/sqft	0	Exhaust conc.	ppmv	4.871	
Total air	acfm	26000		% by vol		1.73
Tank width	ft	2		ton/yr	3.139	
Tank length	ft	12				
Calcs for open tank						
sg	1.10					
%w/w acid	19.54					
%w/w FeCl2	0.00					
vp HCl	0.81					
temp K	293					
vp water	17.467					
1-MR	0.9932					
vp sol'n	17.347					
Air vel	18.056					
HCl loss	0.0299	per sq.ft				
water loss	0.1009	per sq.ft				

Barrel Line #4

INPUT DATA			RESULTS			
Item	Units	Quantity	Item	Units	Quantity	Quantity
HCl in acid	% w/v	21.4			HCl	Water
Fe in acid	% w/v	0	Surface loss	lb/h/sqft	0.020	0.069
Temperature	deg F	68	Total loss	lb/h	0.490	1.657
Exhaust rate	cfm/sqft	0	Exhaust conc.	ppmv	5	
Total air	acfm	16000		% by vol		1.73
Tank width	ft	2		ton/yr	2.148	
Tank length	ft	12				
Calcs for open tank						
sg	1.10					
%w/w acid	19.54					
%w/w FeCl2	0.00					
vp HCl	0.81					
temp K	293					
vp water	17.47					
1-MR	0.99					
vp sol'n	17.35					
Air vel	11.11					
HCl loss	0.0204	per sq.ft				
water loss	0.07	per sq.ft				

Barrel Line #5

INPUT DATA			RESULTS			
Item	Units	Quantity	Item	Units	Quantity	Quantity
HCl in acid	% w/v	21.4			HCl	Water
Fe in acid	% w/v	0	Surface loss	lb/h/sqft	0.030	0.101
Temperature	deg F	68	Total loss	lb/h	0.717	2.422
Exhaust rate	cfm/sqft	0	Exhaust conc.	ppmv	5	
Total air	acfm	26000		% by vol		1.73
Tank width	ft	2		ton/yr	3.139	
Tank length	ft	12				
Calcs for open tank						
sg	1.10					
%w/w acid	19.54					
%w/w FeCl2	0.00					
vp HCl	0.8121					
temp K	293					
vp water	17.47					
1-MR	0.9932					
vp sol'n	17.347					
Air vel	18.06					
HCl loss	0.0299	per sq.ft				
water loss	0.1009	per sq.ft				

Rack Line #3

INPUT DATA			RESULTS			
Item	Units	Quantity	Item	Units	Quantity	Quantity
HCl in acid	% w/v	16			HCl	Water
Fe in acid	% w/v	0	Surface loss	lb/h/sqft	0.002	0.068
Temperature	deg F	68	Total loss	lb/h	0.053	1.663
Exhaust rate	cfm/sqft	0	Exhaust conc.	ppmv	1	
Total air	acfm	16000		% by vol		1.73
Tank width	ft	2.92		ton/yr	0.231	
Tank length	ft	8.33				
Calcs for open tank						
sg	1.08					
%w/w acid	14.76					
%w/w FeCl2	0.00					
vp HCl	0.08716633					
temp K	293					
vp water	17.47					
1-MR	0.9931709					
vp sol'n	17.34745576					
Air vel	10.96					
HCl loss	0.0022	per sq.ft				
water loss	0.06835776	per sq.ft				

Total Potential HCl Emissions (tons/yr): 8.66

These emission calculation are for acid pickling and are conservative for this type of operation.

SOURCES OF DATA - HCl TANKS
Vapor pressure of pickling solutions: Dow Chemical, from 'Development of hydrochloric acid pickling of steel in India', Akerkar, D.D. and Shahani, NML Tech Journal, Vol 12, #11, 87-92, (1970)
Specific gravity of pickling solutions: Esco Engineering lab work
Elevation of boiling point of ferrous chloride: International Critical Tables, McGraw Hill, 1926
Emissions from open-top tanks: 'Heat Losses from tanks, vats and kettles', Friedman, S.J., Heating and Ventilating, April 1948
Vapor pressure of water: Table of properties of pure compounds', DIPRR, AIChE, 1985
Assumptions for HCl tanks-
Evaporation into air at 60-80 deg F, 70%RH
Essentially atmospheric pressure

Methodology
Calculation methodology by Esco Engineering, Kingsville, Ontario - March 1993

CORRECTION FACTORS - Esco Engineering, Kingsville, Ontario - March 1993

The spreadsheet calculations give maximum values for emissions based on the assumptions, i.e.
- all air passes over the whole liquid surface
- air above the liquid contains no acid vapor
- air/acid vapor/water vapor are uniformly mixed

In practice, some air will short-circuit, and only pass over some of the surface, and the mixture will not be uniform.
Also, the evaporation into the air will reduce the rate of evaporation towards the outlet end of the air flow.
Calculations on the effect of the build-up of acid and water vapors in the air show that this introduces an error of less than 10% (high) in the estimate, for typical pickling conditions.
Comparison of estimated and measured values show that the estimates are fairly good for open tanks.
Uneven air flow, and incomplete mixing, in closed picklers, have quite a significant effect in reducing rates of evaporation.