

Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109
(415) 771-6000

**Permit Evaluation
for
MAJOR FACILITY REVIEW PERMIT
Significant Revision**

**for
United Airlines – San Francisco Maintenance Center
Facility #A0051**

Facility Address:

Maintenance Base Bldg 49-2 - SFOMP
San Francisco International Airport
San Francisco, CA 94128-3800

Mailing Address:

Same As Above

Title V – Significant Revision

A. Background

The United Airlines San Francisco Maintenance Center is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, Part 70 of Volume 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review because it has the potential to emit 100 tons per year or more of nitrogen oxides (NOx).

This facility was issued a Major Facility Operating Permit (Title V Permit) on March 20, 2000. Since the initial issuance, United has requested that a number of changes be made, including the removal of permitted sources, the addition of new sources, modifications to existing sources, and the correction of erroneous information. The District is proposing to revise the Title V permit in several respects, including the incorporation of several District permits issued or modified since the issuance of the Title V permit. District permits are applicable requirements, and so the incorporation of these permit revisions is necessary so that the Title V permit accurately reflects all applicable requirements. The proposed revisions include permit modifications made in six District permit applications, the details of which are included in the attached Engineering Evaluation Reports. The potential increase of criteria pollutant emissions for each of these applications is summarized as follows:

Permit Application #	Pollutant Increase (tons/yr)				
	NOx	CO	POC	SO2	PM
1870	39.049	1.000	0.083	0.318	1.321
2582	N/A	N/A	N/A	N/A	N/A
2818	0.000	0.000	0.161	0.000	0.000
2894	0.000	0.000	0.483	0.000	0.000
2941	N/A	N/A	N/A	N/A	N/A
3285	0.000	0.000	1.214	0.000	0.000
6913	N/A	N/A	N/A	N/A	N/A
Total	39.049	1.000	1.941	0.318	1.321

In accordance with BAAQMD Regulation 2-2-302, United was required to provide emissions offsets for NOx and POC at a ratio of 1.15 to 1.0. A total of **44.906 tons/yr NOx** and **2.231 tons/yr POC** offsets were provided as follows:

Banking Certificate Number	Offsets Provided (tons/yr)	
	NOx	POC
47	N/A	1.451
316	N/A	0.500
553	4.220	N/A
725	6.037	0.280
745	28.500	N/A
747	1.200	N/A
794	4.949	N/A

In addition to the changes requested by United, the District has made updates and corrections to the permit as noted below.

This is a “Significant Permit Revision” as defined by BAAQMD Regulation 2-6-226.3, because the monitoring requirements for the now exempt abrasive blast equipment were removed (see Appendix A, Application #2582). All other changes made to the permit are classified as either “Administrative Permit Amendments” or “Minor Permit Revisions”.

B. Permit Content

The following is a brief explanation of the changes made to each section of the permit. The changes are discussed in the order in which they are presented in the permit.

I. Standard Conditions

The dates in Subsection A “Administrative Requirements” have been updated.

Minor changes were made to Subsections B, E, and H to coincide with the District’s current standard language for these subsections.

II. Equipment

Table II A - Permitted Sources

Numerous additions and deletions were made to Table II A. These changes were the result of permitting actions that include the following: (1) the issuance of permits for new or unpermitted sources, (2) deletion of sources that have been permanently removed from service, (3) the exemption of sources no longer required to have District permits, (4) combining electric curing ovens with the coating sources that they service, and (5) transfer of source responsibility.

The changes made to Table II A are summarized as follows:

Source	Description	Permit Action	Application #	Comments
2	Solvent Spray Booth	Deleted	N/A	Archived as requested by United, 7/31/01
3	Parts Washer	Deleted	N/A	Archived as requested by United, 7/31/01
4	Parts Washer	Deleted	N/A	Archived as requested by United, 7/31/01
5	Parts Washer	Deleted	N/A	Archived as requested by United, 7/31/01
27	Shot Peening Machine	Deleted	2582	Exempted from permits, 4/10/01
32	Intermediate Case Chrome Operation	Deleted	N/A	Archived as requested by United, 7/31/01
38	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
41	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
42	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
43	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
44	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
52	Sermetal J Spray Booth	Deleted	2941	Exempted from permits, 12/17/01
53	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
62	Paint Spray Room	Deleted	2941	Exempted from permits, 12/17/01
71	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
78	Solvent Spray Booth	Added	N/A	Mistakenly archived permit reinstated as requested by United, 4/11/01
Source	Description	Permit Action	Application #	Comments
82	Abrasive Blast Booth	Deleted	2582	Exempted from permits, 4/10/01
84	Engine Test Cell #1	Deleted	1870	Archived as requested by United, 7/31/01

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85	Engine Test Cell #2	Deleted	1870	Archived as requested by United, 7/31/01
86	Engine Test Cell #3	Deleted	N/A	Archived as requested by United, 7/31/01
93	Paint Spray Booth	Deleted	N/A	Archived as requested by United, 7/31/01
108	Drying Oven	Deleted	N/A	Grouped with Varnish Dip Tank S-110
109	Drying Oven	Deleted	N/A	Grouped with Varnish Dip Tank S-110
118	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
119	Grit Blasting Room	Deleted	2582	Exempted from permits, 4/10/01
122	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
127	Infrared Dryer	Deleted	N/A	Grouped with Paint Booth S-126
151	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
154	Varnish Curing Oven	Deleted	N/A	Grouped with Varnish Dip Tank S-191
169	Gasoline Dispensing Island	Deleted	N/A	Archived as requested by United, 5/2/02
185	Shot Peening Machine	Deleted	2582	Exempted from permits, 4/10/01
197	Oil Separation Plant	Deleted	N/A	Archived as requested by United, 7/31/01
200	Plastic Media Abrasive Cleaning Booth	Deleted	2582	Exempted from permits, 4/10/01
203	Abrasive Blaster	Deleted	N/A	Archived as requested by United, 1/16/01
214	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
215	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
223	Grit Blasting Room	Deleted	2582	Exempted from permits, 4/10/01
224	Shot Peen Equipment	Deleted	2582	Exempted from permits, 4/10/01
226	Abrasive Blast Machine	Deleted	2582	Exempted from permits, 4/10/01
235	Curing Oven	Deleted	N/A	Grouped with Varnish Dip Tank S-110
250	Grit Blast Machine	Deleted	N/A	Archived as requested by United, 4/10/01
251	Grit Blast Machine	Deleted	N/A	Archived as requested by United, 4/10/01
252	Grit Blast Machine	Deleted	N/A	Archived as requested by United, 4/10/01
265	Pneumatic Shot Peening Machine	Deleted	2582	Exempted from permits, 4/10/01
266	Coating Spray Booth	Deleted	2941	Exempted from permits, 12/17/01
267	Electric Curing Oven	Deleted	N/A	Grouped with Dry Lube Booth S-48
268	Electric Curing Oven	Deleted	2941	Exempted from permits, 12/17/01
270	Coating Strip Tank	Deleted	N/A	Archived as requested by United, 5/2/02
271	Vapor Solvent Cleaner	Deleted	N/A	Archived as requested by United, 12/1/98
277	Paint Spray Booth	Deleted	N/A	Transferred to P# 12197, United Airlines SFOPV. The Paint Booth is used for ground equipment associated with terminal operations.
278	Soil Vapor Extraction System	Added	18211	District permit issued 8/10/99
279	Soil Vapor Extraction System	Added	18788	District permit issued 8/10/99
281	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
282	Grit Blaster	Deleted	2582	Exempted from permits, 4/10/01
283	Abrasive Blast Booth	Deleted	2582	Exempted from permits, 4/10/01
284	Oil Cooler Flush Cart	Added	2818	District permit issued 3/31/01
285	Non-Retail Gasoline Dispensing Facility	Added	2836	District permit issued 6/5/01
286	Recycling Parts Washer	Added	2894	District permit issued 12/4/01
Source	Description	Permit Action	Application #	Comments
287	Recycling Parts Washer	Added	2894	District permit issued 12/4/01
288	Recycling Parts Washer	Added	2894	District permit issued 12/4/01
289	Recycling Parts Washer	Added	2894	District permit issued 12/4/01
290	Recycling Parts Washer	Added	2894	District permit issued 12/4/01

291	Parts Washer	Added	3285	District permit issued 9/6/01
292	Parts Washer	Added	3285	District permit issued 9/6/01
293	Parts Washer	Added	3285	District permit issued 9/6/01

Notes on Comments:

- “Archived as requested by United,” means that the District was notified in writing that the source was permanently removed from service and therefore a permit to operate was no longer required.
- Electric curing/drying ovens were grouped with their respective coating sources at the request of United and in accordance with District regulations. Although VOC emissions from these coating operations occur both at the coater and the drying/curing oven(s), it is more efficient from a regulatory perspective to focus on the overall emissions from the combined operation. The ovens are integral to the coating operations and have no other function.
- The Paint Spray Booth S-277 was never located at the United S.F. Maintenance Center, P#51 and was mistakenly listed as part of that facility. It is located at a United “Terminal Operations” facility that is over 0.5 miles from P# 51 and is not on contiguous property. The long-term parking lot and airport rental car facilities separate the two locations.

Table II B – Abatement Devices

Abatement devices for sources that have either been exempted from permits or archived have been deleted from the permit.

III. Generally Applicable Requirements

This section of the permit lists requirements that generally apply to all sources at a facility including insignificant sources and portable equipment that may not require a District permit. If a generally applicable requirement applies specifically to a source that is permitted or significant, the standard will also appear in Section IV and the monitoring for that requirement will appear in Sections IV and VII of the permit. Parts of this section apply to all facilities (e.g., particulate, architectural coating, odorous substance, and sandblasting standards). In addition, standards that apply to insignificant or unpermitted sources at a facility (e.g., refrigeration units that use more than 50 pounds of an ozone-depleting compound) are placed in this section.

Changes to this section of the permit include updating the text to the current standard, updating the applicable requirements in Table III to reflect the current versions of the cited regulations and the addition of generally applicable requirements that were overlooked in the initial Title V permit. For example, the current BAAQMD and SIP versions of Regulation 8, Rule 16 were added because United has unpermitted sources not included in the Title V permit that are subject to these requirements.

IV. Source-Specific Applicable Requirements

This section of the permit lists the applicable requirements that apply to permitted or significant sources. These applicable requirements are contained in tables that pertain to one or more sources that have the same requirements. The order of the requirements is:

- District Rules
- SIP Rules (if any) are listed following the corresponding District rules. SIP rules are District rules that have been approved by EPA for inclusion in the California State Implementation

Plan. SIP rules are “federally enforceable” and a “Y” (yes) indication will appear in the “Federally Enforceable” column. If the SIP rule is the current District rule, separate citation of the SIP rule is not necessary and the “Federally Enforceable” column will have a “Y” for “yes”. If the SIP rule is not the current District rule, the SIP rule or the necessary portion of the SIP rule is cited separately after the District rule. The SIP portion will be federally enforceable; the non-SIP version will not be federally enforceable, unless EPA has approved it through another program.

- Other District requirements, such as the Manual of Procedures, as appropriate.
- Federal requirements (other than SIP provisions)
- BAAQMD permit conditions. The text of BAAQMD permit conditions is found in Section VI of the permit.
- Federal permit conditions. The text of Federal permit conditions, if any, is found in Section VI of the permit.

Section IV of the permit contains citations to all of the applicable requirements. The text of the requirements is found in the regulations, which are readily available on the District’s or EPA’s websites, or in the permit conditions, which are found in Section VI of the permit. All monitoring requirements are cited in Section IV. Section VII is a cross-reference between the limits and monitoring requirements. A discussion of monitoring is included in Section C.VII of this permit evaluation/statement of basis.

Changes to this Section IV are primarily routine and include the updating of text to the current standard, updating the applicable requirements tables to reflect the current versions of the cited regulations, addition and deletion of applicable requirements tables for sources that have been added or removed as discussed in Part II above. However, in some cases applicable requirements have been added or removed at the request of United where there were errors or omissions in the initial permit. A discussion of these “non-routine” changes follows.

Table IV B – Chrome Plating Operations

The operation of the chrome plating line is subject to the requirements of Regulation 11, Rule 8 and BAAQMD Permit Condition #6465. Regulation 11-8 “Hexavalent Chromium Airborne Toxic Control Measure for Chrome Plating and Chromic Acid Anodizing Operations” adopts by reference the provisions of CCR Title 17, Division 3, Chapter 1, Subchapter 7.5, Section 93102, (i.e. the CARB ATCM for Hexavalent Chromium). Changes were made to the applicable requirements for the chrome plating line as follows:

- ATCM Section 93102(k) “Procedure for Establishing Alternative Requirements” was added.
- In the existing Title V permit, District Permit Condition #6465, part 4 requires a weekly measurement of differential pressure upstream of each “fiberbed filter”. Since this requirement was clearly out of date with Regulation 11-8 and the monitoring actually being performed by United, it was deleted and replaced with parts 4 through 7. The existing part 5 was renumbered as part 8.
- In order to accommodate specific factors affecting the chromium abatement equipment at the facility, the District approved “Alternative Requirements” in accordance with ATCM Section

93102(k) for Sections 93102(e)(2) “pressure drop” and (e)(3) ”inlet velocity pressure”. The alternative requirements are given in parts 5, 6, and 9 of Condition #6465.

Table IV H – Aircraft Washing Area

BAAQMD Regulation 6 requirements were removed because the Aircraft Washing Area is not a source of particulates. Regulation 8, Rule 4 requirements were added because cleaning agents containing volatile organic compounds are used.

Table IV M – Miscellaneous Coating Paint Booths

The NESHAP requirements for Aerospace Manufacturing and Rework Facilities were removed because it was determined that they were not applicable to the type of coating being performed at these paint booths. The NESHAP only applies to parts and assemblies that are critical to an aircraft’s structural integrity or flight performance. The Miscellaneous Coating Paint Booths are used for cabin components (e.g. seats, storage bins, etc.).

Table IV P – Facilities Paint Booths

At United’s request, applicable requirements for the Non Aerospace Paint Booths S156 and S157 were combined with the Mobile Equipment/Motor Vehicle Paint Booth S155 and the 3 sources were renamed “Facilities Paint Booths”. In addition to the applicable requirements initially cited for the 3 paint booths, United requested that the applicable requirements of Regulation 8, Rule 14 “Surface Coating of Large Appliances and Metal Furniture” and Regulation 8, Rule 49 “Aerosol Paint Products” be added to the permit.

Table IV X – Miscellaneous Resin Laminating

At United’s request, the requirements for Regulation 8, Rule 50 “Polyester Resin Operations” were removed from the table and replaced with the applicable requirements for Regulation 8, Rule 4 “General Solvent and Surface Coating Operations”. This change was made because Regulation 8-50 applies only to the manufacturing of products using polyester resins. United’s resin laminating operations are limited to small repairs of existing laminated products.

Table IV CC – Aerospace Corrosion Inhibitor Spray Booth

The NESHAP requirements for Aerospace Manufacturing and Rework Facilities were removed because it was determined that they were not applicable to the type of coating being performed at this spray booth. Per 40 CFR 63.741(f) the NESHAP does not contain control requirements for “specialty coatings”. Specialty coatings, as defined in 63.742, include coatings used for enhanced corrosion protection. Since there are no applicable control requirements for the application of corrosion inhibitors, none of the other sections of the NESHAP apply (e.g. monitoring, recordkeeping, reporting).

V. Schedule of Compliance

The only change made to this section of the permit was a revision of the standard text.

VI. Permit Conditions

As part of the Title V permit revision, the District is proposing changes made to several permit conditions, these include: deleted conditions for sources that no longer have permits, added conditions for new sources, and, as appropriate, revised conditions for clarity and enforceability. The Title V permit is being updated to accurately reflect these applicable requirements. All

changes to existing permit conditions are clearly shown in “strike-out/underline” format in the proposed permit. When the permit is issued, all ‘strike-out’ language will be deleted; all “underline” language will be retained, subject to consideration of comments received. Where changes have been made more than once as a result of comments from United (e.g. Permit Condition #14315), the original underlined text has been struck through and the proposed new text is italicized and underlined.

Although most changes to this section of the permit are a result of the various additions and deletions of permitted sources discussed in Part II “Equipment”, revisions were made to the permit conditions for existing sources as follows:

Condition #6465

As previously discussed in Part IV, the permit conditions for the Chrome Plating Operations were modified at the request of United to clarify applicable requirements and to add alternative requirements to those specified in the ATCM. Alternative requirements that expand the pressure drop and inlet velocity pressure ranges required by ATCM Sections 93102(e)(2) and (e)(3) were added as parts 5 and 6 of Condition #6465 and a bi-annual source test requirement was added as part 9.

Condition #14315

Modifications made to Permit Condition #14315 are the result of the following actions taken by United and the District:

On April 30, 2002, the District issued a Modified Permit to Operate to United Airlines SF Maintenance Center (P# 51) for Engine Test Cell #5, S-90. The modification increased the overall fuel usage at the source from 442,000 gal/yr to 764,000 gal/yr and set individual fuel usage limits for each engine model category. These limits, in conjunction with engine model specific emission factors were used to ensure compliance with New Source Review (NSR) emissions limits.

On May 17, 2002, United requested administrative changes to the new permit conditions for S-90 to provide for greater operational flexibility. United requested that the engine model specific fuel usage limits for all but the most common engine model tested be dropped and replaced with an overall NOx emissions cap of 90.9 tons/yr. Instead of fuel usage limits, engine specific emission factors would be used in conjunction with actual fuel usage to determine the mass emissions of NOx on a monthly basis. This approach would give United the flexibility to test more than the average amount of some engine models (and less of others) during any given 12-month period. The overall fuel usage limit of 764,000 gallons per year will be retained. United initially requested that NOx emissions be determined by using a single weighted average emission factor for each engine model tested. However, the District concluded that this approach would not adequately demonstrate compliance with the 90.9 ton/yr NOx limit because the emissions vary so widely from the “idle” test mode to the “take off” test mode. Therefore, it was determined that the NOx emissions for each engine type should be calculated using the actual fuel consumed during each test mode and the specific emission factors for each test mode. This will require United to keep detailed fuel consumption records for each engine model and use four emission factors per engine model rather than one. The latest version of the conditions for S-90 reflects these changes.

VII. Applicable Limits and Compliance Monitoring Requirements

This section of the permit is a summary of numerical limits and related monitoring requirements for each source. The summary includes a citation for each monitoring requirement, frequency of monitoring, and type of monitoring. The applicable requirements for monitoring are completely contained in Sections IV, Source-Specific Applicable Requirements, and VI, Permit Conditions, of the permit.

Changes made to this section of the permit generally reflect the changes to other parts of the permit that have previously been discussed. However, a significant change to monitoring that has not been discussed is the removal of monitoring requirements for all of the abrasive blast equipment that was initially included in the Title V permit, but has subsequently been exempted from permitting requirements (see Application #2582).

The regulation that now exempts the abrasive blast equipment from permitting, Regulation 2-1-103 (i.e. emissions <10 lb/day and not specifically subject to any District regulation), was adopted by the District on 6/7/95. Since United initially submitted their Title V application on 7/24/96, had United requested an exemption review, the abrasive blasters could have been exempted prior to the Title V submittal and never been included in the permit. However, United made no such request for exemption so the abrasive blasters were included in the Title V permit and in accordance with District policy, permit conditions requiring periodic pressure drop monitoring and visual inspections of baghouses and particle filters were added. Since the District is now proposing that the monitoring requirements be removed from the permit, a discussion of the impact that the monitoring has on compliance with applicable requirements is warranted.

As abrasive blast booths are potentially a source of particulate matter emissions, they are subject to District Regulation 6 “Particulate Matter and Visible Emissions”. However, as discussed in Application #2582, the actual particulate matter emissions from the enclosed abrasive blasters are believed to be negligible, making it highly unlikely that a Regulation 6 standard would be violated, with or without monitoring. A search of the District’s data bank reveals that since 1990 there has never been a documented violation of a Regulation 6 requirement at United (P# 51). A similar search reveals that the District has never received a public complaint regarding particulate emissions from P# 51. Is it therefore assumed that the operation of the abrasive blast booths consistent with their historical operation is not likely to violate the applicable emissions standards. The abrasive blast equipment will continue to subject to Regulation 6 as a federally enforceable regulation, as Regulation 6 is included as a Generally Applicable Requirement in Part III of the Title V permit.

VIII. Test Methods

This section of the permit lists test methods that are associated with standards in District or other rules. It is included only for reference. In most cases, the test methods in the rules are source test methods that can be used to determine compliance but are not required on an ongoing basis. They are not applicable requirements. If a rule or permit condition requires ongoing testing, the requirement will also appear in Section IV of the permit.

The changes made to this section include the correction of the MOP Volume III, Method 31 description and the removal of test methods for applicable regulations and permit conditions that have been deleted from the permit.

IX. Permit Shield:

The permit shields included in United's Title V permit identify and justify specific federally enforceable regulations and standards that are not applicable to a source or group of sources.

Minor changes were made to this section in accordance with the changes that have been previously discussed.

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APPENDIX A
BAAQMD ENGINEERING EVALUATION REPORTS

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – SF MAINTENANCE CENTER
APPLICATION NUMBER 001870**

BACKGROUND:

One of the primary facility functions for the United Airlines San Francisco Maintenance Center, P# 51, is to maintain jet aircraft engines such that the operation of those engines meets all federal, original equipment manufacturer (OEM) and United Airlines requirements and specifications. Each jet engine in the United fleet must be certified for airworthiness by the Federal Aviation Administration (FAA). Prior to installation on aircraft, jet engines must be thoroughly tested over a range of operating conditions at four power levels; idle (7%), approach (30%), climb out (85%), and take off (100%). In order to perform the operational testing required for FAA certification of their engines, United currently operates four engine test cells at the SF Maintenance Center.

The Boeing 777 aircraft is a growing component of the United fleet. Test Cell #5 at the San Francisco Maintenance Center is the only engine test cell at a United facility designed to test 777 aircraft engines. Therefore, in order to meet the increasing requirement to test these engines, United is requesting a modification to their permit to operate **Engine Test Cell #5, S-90**.

Permit Condition #14315 currently limits fuel consumption at Test Cell #5 to 442,000 gallons per year. United initially requested a new fuel usage limit of 1,037,450 gallons per year in their March 23, 2001 submittal. However, due to the permitting difficulties that this large of an increase would cause (e.g. Offsets, PSD), United has amended their request to 764,000 gallons per year ("Revised Addendum to ATC Application #001870", September 28, 2001) In order to partially offset the increased emissions from S-90, United is shutting down Engine Test Cells #1 and #2 (S-84 and S-85) and has requested contemporaneous emission reduction credits.

EMISSION CALCULATIONS:

Baseline Emissions

The following emission factors for S-90 are currently listed in the District's databank:

- NOx: 43.0 pounds per 1,000 gallons fuel (lb/Mgal)
- CO: 76.0 lb/Mgal
- POC: 36.0 lb/Mgal
- SO2: 2.9 lb/Mgal
- PM: 42.0 lb/Mgal

Upon review of these factors United became aware that the factors were not accurately representing the emissions from Test Cell #5. In particular they found that NOx emissions were being significantly underestimated. As a result, United has developed emission factors for the test cell based on actual engine specific source test data. These factors will be used to calculate both the existing "actual" baseline emissions and the increase of emissions associated with the requested increase of fuel usage at S-90.

Emission Factors

United currently tests the following aircraft engine types at Engine Test Cell #5:

Aircraft	Engine Model
• Boeing 777	PW4090
• Boeing 777	PW4077
• Boeing 767/747	PW4060
• Boeing 757	PW2000
• Boeing 737	CFM 56-3C-1

Based on manufacturer's source test results listed in the International Civil Aviation Organization (ICAO) database, United has developed NOx, CO, and POC emission factors for each engine type at the four operating modes (e.g. idle, approach, climb out, and take off). These factors are significantly different from

those used by the District in the past, but are assumed to be more accurate because they are based on actual engine specific source test results at four different power levels.

Since particulate (PM) emissions were not included in the ICAO database, United has proposed using a PM emission factor from the Source Classification Code (SCC) AIRS Database. SCC 2-04-001-02 lists a PM emission factor of 11.8 pounds per 1,000 gallons of fuel (lb/Mgal) for “Internal Combustion Engines, Engine Testing, Aircraft, Turboshaft”.

SO2 emissions are based on the sulfur content of the fuel. United has stated that all jet fuel (7.09 lb/gal) used at the Jet Engine Test Cells has a sulfur content equal to or less than 0.02% by weight. Therefore, assuming all sulfur is converted to SO2, the SO2 emission factor will be as follows:

$$\begin{aligned}
 \text{SO}_2 &= (7.09 \text{ lb fuel/gallon fuel})(0.0002 \text{ lb S/lb fuel})(\text{lb-mole S}/32 \text{ lb S})(\text{lb-mole SO}_2/\text{lb-mole S})(64 \text{ lb SO}_2/\text{lb-mole SO}_2) \\
 &= 0.00284 \text{ lb SO}_2/\text{gal fuel} \\
 &= 2.84 \text{ lb/Mgal}
 \end{aligned}$$

The emission factors proposed by United for each engine tested at S-90 (in pounds per 1,000 gallons of fuel, lb/Mgal) are summarized in Table I below.

Table I: Summary of Jet Engine Emission Factors

Engine Model	Power Level	Emission Factors (lb/Mgal)				
		NOx	CO	POC	SO2	PM
PW4090	Idle	30.42	146.27	16.31	2.84	11.80
	Approach	93.52	3.12	0.43	2.84	11.80
	Climb Out	303.45	1.63	0.21	2.84	11.80
	Take Off	432.49	1.35	0.21	2.84	11.80
PW4077	Idle	29.78	143.22	21.27	2.84	11.80
	Approach	80.12	2.84	1.42	2.84	11.80
	Climb Out	230.43	0.71	0.71	2.84	11.80
	Take Off	282.18	0.71	0.71	2.84	11.80
PW4060	Idle	34.74	141.80	11.77	2.84	11.80
	Approach	85.08	12.62	0.99	2.84	11.80
	Climb Out	175.12	3.62	0.21	2.84	11.80
	Take Off	232.55	2.62	0.71	2.84	11.80
PW2000	Idle	29.78	177.96	15.95	2.84	11.80
	Approach	75.15	14.18	1.28	2.84	11.80
	Climb Out	193.56	2.84	0.25	2.84	11.80
	Take Off	243.19	2.84	0.18	2.84	11.80
CFM56-3C-1	Idle	30.49	190.01	10.07	2.84	11.80
	Approach	64.52	21.98	0.50	2.84	11.80
	Climb Out	126.20	6.38	0.28	2.84	11.80
	Take Off	146.76	6.38	0.21	2.84	11.80

Determination of Baseline Emissions

The attached spreadsheet, Tables 1A through 1E, were used to calculate the baseline emissions for the Engine Test Cell, S-90.

The baseline emissions from S-90 were determined using the following methodology:

1. The NOx, CO, POC, SO2, and PM emissions for each engine model were calculated at each of the four power levels (idle, approach, climb out, and take off) using the above emission factors and known fuel consumption rates.
2. The resulting emission totals at each power level were then summed, and divided by the total amount of fuel consumed by the particular engine model to yield a set of weighted average emission factors for each engine model tested (see Table II below).
3. The total emissions from each engine model were added together and divided by the total amount of fuel combusted for all engines to provide a single set of emission factors that accurately predict the combined emissions of all five engine models based on total fuel usage. These are the baseline emission factors. (see Table III below)
4. Baseline emissions are then determined by multiplying the baseline emission factors by the baseline fuel usage. (see Table III below)

Table II: Weighted Average Emission Factors by Engine Model

Engine Model	Weighted Average Emission Factors (lb/Mgal)				
	NOx	CO	POC	SO2	PM
PW4090	307.53	10.02	1.16	2.84	11.80
PW4077	221.47	10.00	2.08	2.84	11.80
PW4060	171.84	12.98	1.13	2.84	11.80
PW2000	180.55	17.35	1.54	2.84	11.80
CFM 56-3C-1	117.05	22.33	1.05	2.84	11.80

Table III: Summary of Baseline Emissions at S-90

Pollutant	Baseline Emission Factors (lb/Mgal)	Baseline Fuel Usage (Mgal/yr)	Baseline Emissions (tons/yr)
NOx	211.73	442.00	46.792
CO	13.96	442.00	3.086
POC	1.32	442.00	0.293
SO2	2.84	442.00	0.628
PM	11.77	442.00	2.608

Net Emissions Increase

United has based their proposed future emissions at S-90 on a specific fuel usage limit for each engine model. They have broken down the requested 764,000 gal/yr jet fuel limit at Test Cell #5 as follows:

Engine Model	Proposed Fuel Usage
• PW4090	344,500 gal/yr
• PW4077	125,500 gal/yr
• PW4060	120,000 gal/yr
• PW2000	110,000 gal/yr
• CFM 56-3C-1	63,000 gal/yr

The attached spreadsheet, Table 2, calculates the projected annual emissions for S-90 using the above engine specific proposed fuel limits and the engine specific weighted average emission factors shown in Table II above. Table IV below shows the summation of the projected emissions from all engine types tested at S-90, the baseline emissions (from Table III), and the net emissions increase.

Table IV: Net Emissions Increase at S-90

Pollutant	Total Projected Emissions (tons/yr)	Baseline Emissions (tons/yr)	Net Emissions Increase (tons/yr)
NOx	90.908	46.792	44.116
CO	4.795	3.086	1.709
POC	0.517	0.293	0.224
SO2	1.085	0.628	0.457
PM	4.508	2.608	1.900

CUMULATIVE EMISSIONS:

The cumulative increase for this application is equivalent to the “Net Emissions Increase” in Table IV above.

Pre-Existing Cumulative Increase

The “Cumulative Increase” as defined by Regulation 2-2-212 is the aggregate sum of all increases in emissions of any given pollutant from a facility pursuant to authorities to construct or permits to operate issued after April 5, 1991 (unless a PSD Baseline Date is applicable). Since April 5, 1991 there has been one other permit application to modify S-90, (Application #16167, P/O issued 08/01/96). United applied for the modification because they needed to upgrade their facilities to accommodate the testing of engines used on the Boeing 777 (e.g. engine models PW4090 and PW4077). In this application, the District determined that the testing of the new engines, with no increase of fuel usage, would increase NOx emissions by 3.67 tons/yr. The emissions increase was based on a total of 442,000 gallons of fuel being used at S-90, the previous year’s fuel consumption. A fuel usage limit of 442,000 gal/yr was added as a permit condition for S-90 (S-90 had no previous fuel usage limits) and a cumulative NOx increase of 3.67 tons/yr was assigned to the application.

As previously stated, emissions from S-90 have apparently been misrepresented by the District in the past. As a result, the cumulative increase for the source has likewise been misrepresented. In accordance with Regulation 2-2-604.2 (June 15, 1994 version), the emissions increase (and cumulative increase) associated with Application #16167 should have been determined by subtracting the actual annual emissions for the highest 12 consecutive month period occurring during the last five years immediately preceding the application date (05/01/96), from the new permitted emissions. This procedure was not followed.

To determine the actual S-90 emissions increase from Application 16167 in accordance with Regulation 2-2-604.2, United has provided engine and fuel usage data for 1993, the year with the highest fuel usage in the five-year period prior to the application.

Engine Model	1993 Fuel Usage
• PW4060	98,800 gal/yr
• PW2000	102,700 gal/yr
• JT9D-7A	32,977 gal/yr
• JT9D-7J	125,313 gal/yr
• JT9D-7R4	29,020 gal/yr
• CF6-6	64,899 gal/yr
• CF6-50	13,191 gal/yr
• CFM	77,760 gal/yr

In the attached spreadsheet, Tables 3A through 3H calculate the Weighted Average Emission Factors for each engine type tested at S-90 in 1993. These factors are based on the known fuel consumption rates for each engine at the various power modes (e.g. idle, approach, climb out, and take off), the number of tests performed on each engine type, and the manufacturer’s emission factors from the ICAO database. Table 3I applies the 1993 fuel usage supplied by United to the Weighted Average Emission Factors for each engine type, summarizes the total 1993 emissions from S-90, and compares those emissions to the current baseline emissions. Table V below, summarizes the results of the spreadsheet calculations.

Table V: 1993 Emissions Versus Current Baseline Emissions

Pollutant	1993 Emissions (tons/yr)	Current "Baseline Emissions" (tons/yr)	Difference (tons/yr)
NOx	47.294	46.792	-0.502
CO	8.422	3.086	-5.336
POC	2.030	0.293	-1.737
SO2	0.773	0.628	-0.146
PM	3.213	2.608	-0.606

Since the 1993 emissions are higher than the actual emissions after S-90 was modified, there should not have been any cumulative increase associated with Application #16167. Therefore, there is no pre-existing cumulative increase for S-90. All existing cumulative increase is the result of the increased fuel usage that is the subject of this application.

TOXIC RISK ASSESSMENT:

Emissions estimates for toxic air contaminants from S-90 will be made using factors from the California Air Resources Board database of “California Air Toxics Emission Factors” (CATEF). For Turbines firing 764,000 gal/yr of diesel (no factors for jet fuel), the estimated emissions of toxic air contaminants are summarized as follows in Table VI:

Table VI: Toxic Air Contaminants

Compound	CATEF (Mean) Emission Factor (lb/Mgal)	Estimated Emissions (lb/yr)	Risk Screen Trigger (lb/yr)
Benzo(a)anthracene	8.53 E-05	6.52 E-02	4.4 E-02
Benzo(a)pyrene	8.33 E-05	6.36 E-02	4.4 E-02
Benzo(b)fluoranthene	1.32 E-04	1.01 E-01	4.4 E-02
Benzo(k)fluoranthene	1.30 E-04	9.93 E-02	4.4 E-02
Dibenz(a,h)anthracene	8.25 E-05	6.30 E-02	4.4 E-02
Formaldehyde	3.19 E-02	2.44 E+01	3.3 E+01
Indeno(1,2,3-cd) pyrene	8.26 E-05	6.31 E-02	4.4 E-02
Naphthalene	1.08 E-02	8.25 E+00	2.7 E+02

Since the estimated emissions of several compounds exceed the District’s risk screen triggers, a risk screen is required.

Risk screen modeling performed by the District with the ISCST3 model using SFO surface and Oakland Airport upper air meteorological data found the maximum increased cancer risk to be 0.004 in a million, with a hazard index of 0.00002. Therefore, in accordance with the District’s Risk Management Policy, the levels of risk are not significant and the risk screen passes.

BACT REVIEW:

Best Available Control Technology (BACT) review is triggered for any modified source that has a potential emissions increase greater than 10 pounds per highest day of POC, NPOC, NOx, SO2, PM10, or CO on a pollutant specific basis. Based on the emission calculations presented in this evaluation, BACT review is triggered.

Upon review of various BACT clearinghouses, including BAAQMD, SCAQMD, CARB, and EPA, it was found that no BACT determinations have been made for commercial jet aircraft engine test facilities.

Under Title II, Part B of the Clean Air Act, it is apparently not legal for any agency to attempt to apply BACT to aircraft engine testing. Section 233 states: “No state or political subdivision thereof may adopt or attempt to enforce any standard respecting emissions of any air pollutant from any aircraft or engine thereof unless such standard is identical to a standard applicable to such aircraft under this part.” It is therefore assumed that BACT does not apply to Engine Test Cell #5, S-90.

PSD REVIEW:

In accordance with Regulation 2-2-304, a Prevention of Significant Deterioration (PSD) review is required for a major modification of a major facility if the cumulative increase, from the PSD Baseline Date, minus the contemporaneous emission reduction credits at the facility are in excess of 40 tons per year of sulfur dioxide or nitrogen oxides, or 15 tons per year of PM10. Similarly, Regulation 2-2-305 requires a PSD review for a major modification of a major facility with an increase of 100 tons per year or more of carbon monoxide. PSD review is not required for this application because none of the emission triggers are exceeded.

The cumulative NOx increase for this application is 44.116 tons/yr. Since the increase is greater than 40 tons/yr, the application would be subject to PSD review. However, United has generated contemporaneous emission reduction credits by shutting down the Engine Test Cells #1 and #2 (S-84 and S-85) to partially offset the cumulative increase from this application. A discussion of the contemporaneous emission reduction credits that United has requested follows.

Contemporaneous Emission Reduction Credits

United has requested contemporaneous emission reduction credits from the shutdown of S-84 and S-85. These test cells were recently taken out of service because the engines tested in the cells are no longer maintained at the facility. The engines tested were Pratt & Whitney JT8D engines that are used on Boeing 727-200 and 737-200 aircraft. These aircraft and engines are now maintained by Pratt & Whitney in Columbus, Georgia. Emission reduction credits (ERCs) are calculated using the procedures described in Regulation 2-2-605.

Baseline Period

Since the fuel usage at S-84 and S-85 was not limited by permit conditions, the baseline throughput will be the actual average throughput during the baseline period (ref. 2-2-605.2). The baseline period consists of the 3-year period immediately preceding the date that the application is complete (ref. 2-2-605.1). The application was deemed complete by the District on 9/17/01. Therefore, the baseline period runs from 9/17/98 to 9/17/01. United has provided fuel usage data for S-84 and S-85 during the baseline period as follows:

Table VII: Baseline Fuel Usage; S-84, S-85

Year	Fuel Usage (gallons)	
	Engine Models JT8D-7/9	Engine Models JT8D-15/17
2001 (partial)	988	2,469
2000	11,639	118,265
1999	13,050	96,894
1998 (partial)	6,256	45,057
Total	31,933	262,685

Therefore, the actual annual average fuel usage during the 3-year baseline period is:

- JT8D-7/9: 10,644 gal/yr
- JT8D-15/17: 87,562 gal/yr

Baseline Emission Rate

The baseline emission rate is the average actual emission rate during the baseline period (ref. 2-2-605.3). The attached spreadsheet Tables 4A and 4B calculate the Weighted Average Emission Factors for the two categories of engines tested at S-84 and S-85 using the same methodology as has previously been used.

In spreadsheet Table 4C, the weighted average emission factors are applied to the baseline fuel usage for each engine category to determine the baseline emissions. These emissions represent the contemporaneous emission reduction from the shutdown of S-84 and S-85 and are summarized below:

- NOx: 5.067 tons/yr
- CO: 0.709 tons/yr
- POC: 0.141 tons/yr
- SO2: 0.139 tons/yr
- PM: 0.579 tons/yr

Summary of PSD Applicability

Subtracting the contemporaneous NOx ERC (5.067 tons/yr) from the cumulative NOx increase for S-90 (44.116 tons/yr), the NOx increase with respect to the PSD trigger will be 39.049 tons/yr. Therefore, PSD review is not required.

OFFSET REVIEW:

NOx and POC Offset Requirement

Facilities which emit 50 or more tons per year of precursor organic compounds or nitrogen oxides are required to provide federally enforceable offsets at a ratio of 1.15 to 1.0 for the emissions from any new or modified source and any pre-existing cumulative increase, minus any onsite contemporaneous emission reduction credits.

The increased fuel usage at S-90 will increase NOx emissions by 44.116 tons/yr and POC emissions by 0.224 tons/yr. It has been established that United does not have any pre-existing cumulative increase for S-90 (see Pre-Existing Cumulative Increase discussion above) and a search of the District’s database has confirmed that there is no pre-existing cumulative increase elsewhere at the facility. Emission increases for all applications since 4/5/91 have been fully offset by United. It has also been established that by shutting down the Engine Test Cells #1 and #2 (S-84 and S-85), United has 5.067 tons/yr NOx and 0.141 tons/yr POC available as contemporaneous emission reduction credits. In addition, data provided by United for this application has revealed that offsets were unnecessarily provided by United for Permit Application #16167. United provided 4.22 tons/yr of NOx offsets to offset the supposed increase of 3.67 tons/yr at a ratio of 1.15 to 1.0. However, since there was in fact no cumulative increase for Application #16167, these offsets should be funded back to United to partially offset the NOx emissions increases from this application.

NOx and POC offset requirements for this application are summarized in Table VIII below:

Table VIII: Summary of Offset Requirements for S-90

Pollutant	Cumulative Emissions Increase (tons/yr)	Contemp. ERCs (tons/yr)	Net Emissions Increase (tons/yr)	Offset Ratio	Offsets Required (tons/yr)	Previously Supplied Offsets (tons/yr)	Net Offsets Required (tons/yr)
NOx	44.116	5.067	39.049	1.15:1.0	44.906	4.220	40.686
POC	0.224	0.141	0.083	1.15:1.0	0.095	N/A	0.095

STATEMENT OF COMPLIANCE:

Engine Test Cell #5 is subject to the requirements of Regulation 6 “Particulate Matter and Visible Emissions” and Regulation 9, Rule 1 “Inorganic Gaseous Pollutants – Sulfur Dioxide”.

Particulate Matter and Visible Emissions

BAAQMD Regulation 6-310 limits PM emissions to 0.15 gr/dscf. If it is assumed that jet engine exhaust gases contain 15% excess oxygen averaged over all operating conditions, the Regulation 6-310 limit can be compared to the AP-42 PM emission factor as follows:

From 40 CFR 60, Appendix A, Method 19, Table 19-1, a stoichiometric dry gas combustion factor of 9,190 dscf/MMBTU is given for distillate oil combustion. At 15% excess O₂ this factor becomes:

$$9,190 \times [21\% / (21\% - 15\%)] = 32,165 \text{ dscf (combustion products)/MMBTU}$$

The conversion of 0.15 gr/dscf @ 15% O₂ to lb/MMBTU is then:

$$(32,165 \text{ dscf/MMBTU}) \times (0.15 \text{ gr/dscf}) \times (\text{lb}/7,000 \text{ gr}) = 0.689 \text{ lb/MMBTU}$$

Based on fuel consumption rates and PM emissions data for S-90, the PM emission rate in terms of fuel consumption is 0.084 lb/MMBTU (e.g. 9,016 lb PM/106,960 MMBTU). Since the PM emission rate is well below the converted Regulation 6-310 emission rate, compliance is assumed.

Compliance with the Ringelmann 1.0 limit of Regulation 6-301 will be demonstrated by casual observation.

SO₂ Emissions

Regulation 9-1-304 requires all liquid fuels to have a sulfur content ≤0.5% (wt). United has stated that the “Jet Fuel A” used at S-90 has a maximum sulfur content of 0.02% (wt). Therefore, compliance is expected. Vendor fuel sulfur content certifications will be required to demonstrate compliance with this limit.

Other Requirements

PSD, NSPS, and NESHAPs do not apply. This application is exempt from the requirements of a CEQA review because the permitting of “Internal Combustion Engines” as outlined in Permit Handbook Chapter 2.3 is a ministerial operation.

MODIFIED PERMIT CONDITIONS:

It is recommended that Permit Condition #14315 be modified as shown below to accommodate the proposed operational changes at S-90.

For Source: 90 (Turbine Test Cell #5)

1. ~~The operating time for testing PW 4084 TF (777 aircraft engines) at S-90 shall not exceed 5.0 hours during any consecutive 24 hour period; nor 125.0 hours during any consecutive 12 month period. (basis: Offsets)~~
21. Total fuel usage at S-90 shall not exceed ~~442,000~~ 764,000 gallons of jet fuel during any consecutive 12-month period. (basis: Cumulative Increase, Offsets)

2. Fuel consumption by engine model tested at S-90 shall not exceed the following amounts during any consecutive 12-month period: (basis: Cumulative Increase, Offsets)

<u>Engine Model:</u>	<u>Fuel Consumption:</u>
PW4090	344,500 gallons
PW4077	126,500 gallons
PW4060	120,000 gallons
PW2000	110,000 gallons
CFM 56-3C-1	63,000 gallons

If engine models other than those listed above are to be tested at S-90, United shall first apply for and obtain from the District a modified permit to operate.

3. Only low sulfur jet fuel (<0.5% sulfur by weight) shall be combusted at this source. The maximum sulfur content of the fuel shall be demonstrated by vendor certification. (basis: Regulation 9-1-304)
4. The operator of this source shall check each aircraft engine for visible particulate emissions during the test cycle. If visible emissions from the engine exhaust are detected, the operator shall take the necessary corrective action to stop the emissions. (basis: Regulation 2-1-403)
5. To confirm compliance with the above conditions, the owner/operator of S-90 shall maintain the following records in a District-approved logbook.

- ~~a. On a daily basis, record the hours of operation for testing of the PW 4084 TF aircraft engines.~~
- ~~b. On a monthly basis, record the hours of operation for testing of the PW 4084 TF aircraft engines.~~
- ~~c. On a monthly basis, record the gallons of fuel used per month at S-90 for all engine testing and the maximum fuel sulfur content.~~
- ~~d. On a daily basis, record the results of the visible particulate emissions check for each engine, the duration of any detected visible emissions, and the corrective action taken.~~
- a. The total amount of jet fuel used at S-90 on a monthly basis. Records shall include the actual fuel usage totals for each engine model tested.
- b. Results of the visible particulate emissions check for each engine on a daily basis. Records shall include the duration of any detected visible emissions and what corrective action was taken.

These records shall be kept on-site and made available for District inspection for a period of five years from the date on which a record is made. (basis: Regulation 2-6-501)

RECOMMENDATIONS:

It is recommended that a modified permit to operate be issued to United Airlines SF Maintenance Center for the following:

S-90: Engine Test Cell #5

By: _____
 Ted Hull
 Air Quality Engineer II

**ADDENDUM TO ENGINEERING EVALUATION REPORT
UNITED AIRLINES – SF MAINTENANCE CENTER
APPLICATION NUMBER 001870**

BACKGROUND:

On April 30, 2002, the District issued a Modified Permit to Operate to United Airlines SF Maintenance Center (P# 51) for Engine Test Cell #5, S-90. The modification increased the overall fuel usage at the source from 442,000 gal/yr to 764,000 gal/yr and set individual fuel usage limits for each engine model category. These limits, in conjunction with engine model specific emission factors were used to ensure compliance with New Source Review (NSR) emissions limits.

On May 17, 2002, United requested administrative changes to the new permit conditions for S-90 to provide for greater operational flexibility. United requested that the engine model specific fuel usage limits for all but the most common engine model tested be dropped and replaced with an overall NOx emissions cap. Instead of fuel usage limits, engine specific emission factors would be used in conjunction with actual fuel usage to determine the mass emissions of NOx on a monthly basis. This approach would give United the flexibility to test more than the average amount of some engine models (and less of others) during any given 12-month period. The overall fuel usage limit of 764,000 gallons per year will be retained.

In addition, United has requested that three engine types be added to their permit as follows:

- F-117: An Air Force engine tested under contract. It is the same type of engine as the Model PW2000 currently included on their permit.
- Models JT9D-7J and JT9D-7R4: These engines are occasionally tested by United under contract.

EMISSIONS DISCUSSION:

In Permit Application #001870 it was determined that the modified Test Cell #5 would have the following maximum emissions:

- NOx: 90.908 tons/yr
- CO: 4.795 tons/yr
- POC: 0.517 tons/yr
- SO2: 1.085 tons/yr
- PM: 4.508 tons/yr

United has requested a 90.9 ton/yr NOx based on the following engine model specific, emission factors:

Engine Model	NOx Emission Factors (lb/Mgal)			
	Idle	Approach	Climb Out	Take Off
PW4090	30.42	93.52	303.45	432.49
PW4077	29.78	80.12	230.43	282.18
PW4060	34.74	85.08	175.12	232.55
PW2000	29.78	75.15	193.56	243.19

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Engine Model	NOx Emission Factors (lb/Mgal)			
	Idle	Approach	Climb Out	Take Off
F117	29.78	75.15	193.56	243.19
CFM56-3C-1	30.49	64.52	126.20	146.76
JT9D-7J	23.39	66.64	247.41	318.34
JT9D-7R4	27.65	65.93	217.63	288.52

Emissions of CO, POC, SO2, and PM will continue to be based on the combined weighted average factors currently in use and will be limited by the overall fuel consumption limit. Therefore, no increase of permitted emissions will result from the proposed changes to permit conditions.

CHANGES TO PERMIT CONDITIONS:

Condition #14315

- Total fuel usage at S-90 shall not exceed 764,000 gallons of jet fuel during any consecutive 12-month period. (basis: Cumulative Increase, Offsets)
- Fuel consumption by engine model PW4090 tested at S-90 shall not exceed the following amounts 344,500 gallons during any consecutive 12-month period: (basis: Cumulative Increase, Offsets)

Engine Model:	Fuel Consumption
PW4090	344,500 gallons
PW4077	126,500 gallons
PW4060	120,000 gallons
PW2000	110,000 gallons
CFM 56-3C-1	63,000 gallons

~~If engine models other than those listed above are to be tested at S-90, United shall first apply for and obtain from the District a modified permit to operate.~~

- Total NOx emissions from S-90 shall not exceed 90.9 tons during any consecutive 12-month period. NOx emissions shall be based on the following engine specific emission factors expressed in pounds of NOx per 1,000 gallons of fuel: (basis: Cumulative Increase, Offsets)

PW4090	Idle	30.42
	Approach	93.52
	Climb Out	303.45
	Take Off	432.49
PW4077	Idle	29.78
	Approach	80.12
	Climb Out	230.43
	Take Off	282.18
PW4060	Idle	34.74
	Approach	85.08
	Climb Out	175.12
	Take Off	232.55
PW2000	Idle	29.78

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	Approach	75.15
	Climb Out	193.56
	Take Off	243.19
F117	Idle	29.78
	Approach	75.15
	Climb Out	193.56
	Take Off	243.19
CFM 56-3C-1	Idle	30.49
	Approach	64.52
	Climb Out	126.20
	Take Off	146.76
JT9D-7J	Idle	23.39
	Approach	66.64
	Climb Out	247.41
	Take Off	318.34
JT9D-7R4	Idle	27.65
	Approach	65.93
	Climb Out	217.63
	Take Off	288.52

If engine models other than those listed above are to be tested at S-90, United shall first apply for and obtain from the District a modified permit to operate.

- ~~34.~~ Only low sulfur jet fuel (<0.02% sulfur by weight) shall be combusted at this source. The maximum sulfur content of the fuel shall be demonstrated by vendor certification. (basis: Cumulative Increase)
45. The operator of this source shall check each aircraft engine for visible particulate emissions during the test cycle. If visible emissions from the engine exhaust are detected, the operator shall take the necessary corrective action to stop the emissions. (basis: Regulation 2-1-403)
- ~~56.~~ To confirm compliance with the above conditions, the owner/operator of S-90 shall maintain the following records in a District-approved logbook.
- a. The total amount of jet fuel used at S-90 on a monthly basis. Records shall include the actual fuel usage totals by test mode for each engine model tested.
 - b. Monthly NOx emission calculations for S-90 based on the fuel usage records and emission factors detailed in part 3.
 - ~~b.c.~~ Results of the visible particulate emissions check for each engine on a daily basis. Records shall include the duration of any detected visible emissions and what corrective action was taken.
 - ~~d.~~ Certification of fuel sulfur content.

UNITED AIRLINES – SF MAINTENANCE CENTER: ADDENDUM TO APPLICATION #001870

RECOMMENDATIONS:

It is recommended that Permit Condition #14315 be changed as shown above.

By: _____
Ted Hull
Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – S.F. MAINTENANCE OPERATIONS
APPLICATION NUMBER 002582**

BACKGROUND:

United Airlines – San Francisco Maintenance Operations (P# 51) is currently permitted for the following enclosed abrasive blast equipment:

- S-27: Shot Peening Machine – PV 06101; Wheelabrator Table Blast Room, Abated by Baghouse A-4
- S-38: Grit Blaster, Double Table – PV 06254; Vacu-Blast M-J7028, Abated by Baghouse A-7
- S-41: Grit Blast Machine #1 – PV 06267; Vacu-Blast Mk-IIIP, Abated by Baghouse A-10
- S-42: Grit Blast Machine #2 – PV 06261; Vacu-Blast MkIIP, Abated by Baghouse A-11
- S-43: Grit Blast Machine #3 – PV 06262; Vacu-Blast Mk-III, Abated by Baghouse A-12
- S-44: Grit Blast Machine #4 – PV 06263; Vacu-Blast MkIIIP, Abated by Baghouse A-13
- S-53: Grit Blaster – PV 06225; Pauli & Griffin M-4DHP, Abated by Baghouse A-16
- S-71: Grit Blaster – PV 06233; Pauli & Griffin M-4DHP, Abated by Baghouse A-17
- S-82: Abrasive Blast – PV 06359; Pangborn, Abated by Baghouse A-21
- S-118: Grit Blaster – PV 06235; Cyclo-Blast, Abated by Baghouse A-23
- S-119: Grit Blasting Room – PV 06237; United Airlines Custom Design, Abated by Baghouse A-25
- S-122: Grit Blaster – PV 06236; Pauli & Griffin M-16S, Abated by Baghouse A-25
- S-151: Grit Blaster – PV 06229; Pauli & Griffin 4DH, Abated by Baghouse A-26
- S-185: Shot Peening Machine – PV 06153; Peenamatic M-12150, Abated by Baghouse A-38
- S-200: Plastic Media Abrasive Cleaning Booth; Pauli & Griffin, Abated by Dust Collector Cartridge A-34
- S-214: Grit Blast Booth; Empire E-88025, Abated by Baghouse A-17
- S-215: Grit Blast Booth; Empire E-88026, Abated by Baghouse A-17
- S-223: Grit Blast Room; FAS C-10579, Abated by Baghouse A-43
- S-224: Shot Peen Equipment; Zero Manufacturing, Abated by Baghouse A-44
- S-226: Abrasive Blast Machine – PV 06260; Zero Manufacturing BNP 65-1, Abated by Baghouse A-16
- S-265: Pneumatic Shot Peening Machine; Progressive Technologies 7492, Abated by Dust Collector A-58
- S-281: Grit Blaster – PV 06252; Vacu-Blast M-J1556, Abated by Baghouse A-61
- S-282: Grit Blast Booth, Bldg 84 – PV 06246; Clemco Industries Zero Product Model 720, Abated by Baghouse A-280 and HEPA Filter Unit A-281
- S-283: Abrasive Blast Booth, Bldg 84 – PV 06247; Clemco Industries Zero Product Model 720, Abated by Baghouse A-37

Because particulate emissions from this equipment are thought to be negligible, United has requested an exemption from permits for all enclosed abrasive blast equipment at the facility. The basis for the requested exemption is District Regulation 2-1-103 as follows:

- 2-1-103 Exemption, Source not Subject to any District Rule:** Any source that is not already exempt from the requirements of Section 2-1-301 and 302 as set forth in Sections 2-1-105 to 2-1-128, is exempt from Section 2-1-301 and 302 if the source meets all of the following criteria:
- 103.1 The source is not subject to any of the provisions of Regulation 6⁽¹⁾, Regulation 8⁽²⁾ excluding Rules 1 through 4, Regulations 9 through 12; and
 - 103.2 The source is not subject to any of the provisions of Sections 2-1-316 through 319; and
 - 103.3 Actual emissions of precursor organic compounds (POC), non-precursor organic compounds (NPOC), nitrogen oxides (NO_x), sulfur dioxide (SO₂), PM₁₀ and carbon monoxide (CO) from the source are each less than 10 pounds per highest day. A source also satisfies this criterion if actual emissions of each pollutant are greater than 10 lb/highest day, but total emissions are less than 150 pounds per year, per pollutant.
Note 1: Typically, any source may be subject to Regulation 6, Particulate Matter and Visible Emissions. For the purposes of this section, Regulation 6 applicability shall be limited to the following types of sources that emit PM₁₀: combustion source; material handling/processing; sand, gravel or rock processing; cement, concrete and asphaltic concrete production; tub grinder; or similar PM₁₀-emitting source, as deemed by the APCO.

Note 2: If an exemption in a Regulation 8 Rule indicates that the source is subject to Regulation 8, Rules 1 through 4, then the source must comply with all applicable provisions of Regulation 8, Rules 1 through 4, to qualify for this exemption.

- 103.4 The source is not an ozone generator (a piece of equipment designed to generate ozone) emitting 1 lb/day or more of ozone.

EXEMPTION EVALUATION

In order to qualify for this exemption, the equipment must not be subject to any District Rule as defined by Section 103.1 and have actual emissions of criteria air pollutants less than 10 lb/day on a pollutant specific basis.

Source not Subject to any District Rule

The enclosed abrasive blast equipment at United has the potential to emit particulate matter (PM) to the atmosphere and therefore may be subject to Regulation 6 “Particulate Matter and Visible Emissions”. However, per Section 103.3, Note 1, of the above exemption, Regulation 6 applicability is limited to the following types of PM10 sources; combustion source, material handling/processing, sand, gravel or rock processing; cement, concrete and asphaltic concrete production; tub grinder; or similar PM10-emitting source, as deemed by the APCO. Since the abrasive blast equipment at United is used only for surface preparation and cleaning of metallic parts, it does not fall into any of the listed categories and is not a “similar PM10-emitting source”, Regulation 6 is not applicable in this case.

Actual Emissions of PM10 are Less than 10 Pounds per Highest Day

AP-42 Chapter 13.2.6 discusses particulate emissions from “Abrasive Blasting”. Table 13.2.6-1 lists a Total PM emission factor of 0.69 lb/1,000 lb abrasive for “Abrasive blasting of unspecified metal parts, controlled with a fabric filter”. Based on the AP-42 factor, an abrasive blast unit would have to use 14,493 pounds of abrasive in one day to have PM10 emissions of 10 lb/day. United has stated that the majority of the abrasive booths at the facility use about 500 pounds per month of abrasive, with the larger units using up to 1,500 pounds per month. Therefore, it can be safely assumed that highest daily emissions of PM10 will be below 10 lb/day.

SOURCES OF TOXIC AIR CONTAMINANTS:

In accordance with Regulation 2-1-316, sources that may otherwise be exempt from permitting may lose their exemption if they have emissions of toxic air contaminants that exceed the risk screen triggers listed in Table 2-1-316.

The Abrasive Blast Booth S-282 uses up to 7 lb/hr of “Microblast” as the abrasive blast media. According to the MSDS provided by the manufacturer, “Microblast” may contain up to 40% (wt) nickel, a potential toxic air contaminant. Abated by a HEPA Filter Unit, the highest estimated nickel emissions are 8.6 E-8 lb/hr or 7.5 E-04 lb/yr (assuming continuous operation). This is less than the District’s risk screen trigger of 7.3 E-01 for nickel compounds, therefore, a risk assessment is not required and the source is eligible for exemption.

RECOMMENDATIONS:

It is recommended that a Letter of Exemption be issued to United Airlines – S.F. Maintenance Operations for the above abrasive blasting equipment.

By: _____
 Ted Hull
 Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – SF MAINTENANCE CENTER
APPLICATION NUMBER 002818**

BACKGROUND:

United Airlines – San Francisco Maintenance Center, P#51 has applied for a permit to operate the following:

S-284: Oil Cooler Flush Cart; Testek Model #10190, 100 gallon capacity

S-284 is an enclosed cold solvent cleaner used to clean heat exchanger cores. The unit flushes the heat exchanger core with solvent in forward and reverse directions for 20 minutes in a closed loop system. Following cleaning, the core is allowed to drain into the solvent sink prior to removal from the unit. Evaporative solvent emissions from this operation occur during the draining and part removal stages

EMISSION CALCULATIONS:

United intends to use 50 gal/yr (net) of calibration fluid (Naphthol Spirits, VOC = 6.43 lb/gal) at S-284. Therefore, the highest anticipated POC emissions from S-284 will be 322 lb/yr.

CUMULATIVE EMISSIONS:

(lbs/day)	(tons/yr)
POC = 0.9	POC = 0.161

TOXIC RISK ASSESSMENT:

Petroleum Naphtha is not listed as a toxic air contaminant by the District. No risk screen is required for this application.

BACT REVIEW:

Best Available Control Technology (BACT) review is triggered for any new source with the potential to emit 10 pounds or more per highest day of POC. With a 50 gallon per year solvent usage limit, potential POC emissions should be below the BACT trigger. A BACT review is not required for this application.

OFFSET REVIEW:

Facilities which emit 50 or more tons per year of precursor organic compounds are required to provide federally enforceable offsets at a ratio of 1.15 to 1.0 for the emissions from any new or modified source, plus any pre-existing cumulative increase. United P #51 currently has calculated facility POC emissions of 118.1 tons per year. Therefore, offsets must be provided. At a 1.15 to 1.0 ratio, the offsets required for this application are **0.185 tons/yr**. There is no pre-existing cumulative increase of POC emissions at this facility.

United has agreed to provide the required offsets from Banking Certificate #725

STATEMENT OF COMPLIANCE:

The Oil Cooler Flush Cart S-284 is subject to the Requirements of Regulation 8, Rule 16 “Solvent Cleaning Operations”; Section 303 (Cold Cleaner Requirements) and Section 501 (Solvent Records). From the process description and diagrams provided by United, it appears that the equipment will comply with the Cold Cleaner Requirements listed in 8-16-303.

Permits for “Cold Solvent Cleaning” are considered to be ministerial operations (Permit Handbook Chapter 6.1). Therefore, this application is not subject to CEQA review.

PSD, NSPS, and NESHAPs do not apply.

PERMIT CONDITIONS:

Oil Cooler Flush Cart: S-284

1. The net solvent usage at the Oil Cooler Flush Cart S-284 shall not exceed 50 gallons during any consecutive 12-month period. (basis: Cumulative Increase)
2. Before a solvent other than Naphthol Spirits or District approved equivalent is to be used at S-284, the owner/operator of this equipment shall first apply for, and be granted by the District, a change of permit conditions. (basis: Toxic Risk Management)
3. In order to demonstrate compliance with the above conditions, monthly records of the type and total amount of make-up solvent used shall be recorded in a District approved log. These records shall be kept on site and be available for inspection by District personnel for a period of at least 5 years from the date on which a record was made. (basis: Cumulative Increase, Toxic Risk Management)

RECOMMENDATIONS:

It is recommended that a permit to operate be issued to United Airlines – SF Maintenance Center for the following:

S-284: Oil Cooler Flush Cart; Testek Model #10190, 100 gallon capacity

By: _____
Ted Hull
Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – SF MAINTENANCE CENTER
APPLICATION NUMBER 002894**

BACKGROUND:

United Airlines – San Francisco Maintenance Center, P#51 has applied for permits to operate the following:

- S-286: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-287: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-288: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-289: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-290: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**

S-286 through S-290 are cold solvent cleaners used for general solvent cleaning at various locations throughout the facility. Each parts washer has a basin capacity of 5 gallons of solvent, holds 25 gallons in reserve, and is equipped with a self-contained solvent recycling system.

EMISSION CALCULATIONS:

The Recycling Parts Washers 286 through S-290 use mineral spirits (VOC = 6.44 lb/gal) as the cleaning solvent. United has stated that each parts washer will have net solvent usage of 30 gallons per year. Therefore, the highest POC emissions for each unit will be 193.2 lb/yr.

CUMULATIVE EMISSIONS:

(lbs/day)	(tons/yr)
POC = 2.6	POC = 0.483

TOXIC RISK ASSESSMENT:

The District does not list mineral spirits as a toxic air contaminant. No risk screen is required for this application.

BACT REVIEW:

Best Available Control Technology (BACT) review is triggered for any new source with the potential to emit 10 pounds or more per highest day of POC. With a 30-gallon per year net solvent usage limit for each unit, potential POC emissions should be below the BACT trigger. A BACT review is not required for this application.

OFFSET REVIEW:

Facilities which emit 50 or more tons per year of precursor organic compounds are required to provide federally enforceable offsets at a ratio of 1.15 to 1.0 for the emissions from any new or modified source, plus any pre-existing cumulative increase. United P #51 currently has calculated facility POC emissions of 118.8 tons per year. Therefore, offsets must be provided. At a 1.15 to 1.0 ratio, the offsets required for this application are **0.555 tons/yr**. There is no pre-existing cumulative increase of POC emissions at this facility.

United has agreed to provide the required POC offsets as follows:

- Banking Certificate #316: 0.500 tons
- Banking Certificate #47: 0.055 tons

STATEMENT OF COMPLIANCE:

District Regulations:

The Parts Washers S-286 through S-290 are subject to the Requirements of Regulation 8, Rule 16 “Solvent Cleaning Operations”; Section 303 (Cold Cleaner Requirements) and Section 501 (Solvent Records). From the process description and diagrams provided by United, it appears that the equipment will comply with the Cold Cleaner Requirements listed in 8-16-303.

Permits for “Cold Solvent Cleaning” are considered to be ministerial operations (Permit Handbook Chapter 6.1). Therefore, this application is not subject to CEQA review.

NESHAPs:

CFR 63 Subpart GG “National Emissions Standards for Aerospace Manufacturing and Rework Facilities” exempts hydrocarbon-based solvent cleaning operations from controls if the solvent contains no HAPs and has a maximum vapor pressure of 7 mm Hg @ 20° C. (Ref. 63.744 Table 3). Since the mineral spirits used at S-286 through S-290 has a vapor pressure of 2 mm Hg@ 20° C, the parts washers are not subject to controls. However, record keeping in accordance with Section 63.752 is required.

PSD and NSPS do not apply.

PERMIT CONDITIONS:

Recycling Parts Washers: S-286, S-287, S-288, S-289, S-290

1. The net solvent usage at each of the Parts Washers S-286 through S-290 shall not exceed 30 gallons during any consecutive 12-month period. (basis: Cumulative Increase)
2. Before a solvent other than mineral spirits or District approved equivalent is to be used at S-286, S-287, S-288, S-289, or S-290, the owner/operator of this equipment shall first apply for, and be granted by the District, a change of permit conditions. (basis: Toxic Risk Management)
3. In order to demonstrate compliance with the above conditions, monthly records of the type and total amount of make-up solvent used shall be recorded in a District approved log. These records shall be kept on site and be available for inspection by District personnel for a period of at least 5 years from the date on which a record was made. (basis: Cumulative Increase, Toxic Risk Management)

RECOMMENDATIONS:

It is recommended that a permit to operate be issued to United Airlines – SF Maintenance Center for the following:

- S-286: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-287: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-288: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-289: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**
- S-290: Recycling Parts Washer; System One, Series 500, 30 gallon capacity**

By: _____
 Ted Hull
 Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – S.F. MAINTENANCE OPERATIONS
APPLICATION NUMBER 002941**

BACKGROUND:

United Airlines – San Francisco Maintenance Operations (P# 51) currently has permits from the District for the following surface coating equipment:

S-52: Sermetal J Spray Booth – PV 90307

S-62: Paint Spray Room – PV 90207

S-266: Coating Spray Booth

S-268: Electric Curing Oven (associated with Coating Spray Booth S-266)

S-52, S-62, and S-266 are used to apply Sermetal, a water based aluminum paint that does not contain any VOCs. United has requested that these coating operations be exempted from permitting per Regulation 2-1-119.2.2. This regulation exempts any coating operation that: “Uses exclusively materials that contain less than one percent VOC (wt)”.

EXEMPTION EVALUATION

Upon review of United’s exemption request, it was found that the Sermetal product contains hexavalent chromium, a known toxic air contaminant. Based on an analysis of spray booth emissions proposed by United, hexavalent chromium emissions at each of the spray booths S-52, S-62, and S-266 exceed the District’s risk screen trigger (0.0013 lb/yr). In accordance with Regulation 2-1-316, a source that may otherwise be exempt from permitting will require a permit if the source emits one or more toxic air contaminants in quantities that exceed the risk screen triggers listed in Table 2-1-316, unless the owner/operator of the source can demonstrate that the source would pass a risk screening analysis.

In order to make this demonstration, United conducted risk screens for S-52, S-62, and S-266, in which they assumed annual coating usages 3 to 6 times higher than normal annual usage. The risk screen conducted by United found that the 3 spray booths pass the District’s screening guidelines. United’s modeling was verified in a risk screen conducted by the District, where the combined excess cancer risk was found to be 0.4 in a million and the combined Hazard Index was found to be 0.001. Since it has been demonstrated that the Sermetal coating operations will pass a risk screen, the sources are exempt from permits as noted above.

RECOMMENDATIONS:

It is recommended that a Letter of Exemption be issued to United Airlines – S.F. Maintenance Operations for the above equipment. It is also recommended that these sources be removed from United’s Title V permit, which is currently being modified under Permit Application #1870.

By: _____
Ted Hull
Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES – SF MAINTENANCE CENTER
APPLICATION NUMBER 003285**

BACKGROUND:

United Airlines – San Francisco Maintenance Center, P#51 has applied for permits to operate the following:

S-291: Parts Washer – PV90141; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity

S-292: Parts Washer – PV90143; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity

S-293: Parts Washer – PV90125; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity

S-291, S-292, and S-293 are cold solvent cleaners used to clean hydraulic and pneumatic components. The parts are soaked or cleaned inside the units. During soaking, the lid to the parts washer will remain closed.

EMISSION CALCULATIONS:

The Parts Washers S-291, S-292, and S-293 use LPS “PreSolve” (100% POC, 6.74 lb/gal) as the cleaning solvent. United has stated that each parts washer will have net solvent usage of 120 gallons per year. Therefore, the highest POC emissions for each unit will be 809 lb/yr.

CUMULATIVE EMISSIONS:

(lbs/day)	(tons/yr)
POC = 6.7	POC = 1.214

TOXIC RISK ASSESSMENT:

LPS PreSolve contains Petroleum Naphtha and d-Limonene, neither of which is listed as a toxic air contaminant by the District. No risk screen is required for this application.

BACT REVIEW:

Best Available Control Technology (BACT) review is triggered for any new source with the potential to emit 10 pounds or more per highest day of POC. With a 120 gallon per year net solvent usage limit for each unit, potential POC emissions should be below the BACT trigger. A BACT review is not required for this application.

OFFSET REVIEW:

Facilities which emit 50 or more tons per year of precursor organic compounds are required to provide federally enforceable offsets at a ratio of 1.15 to 1.0 for the emissions from any new or modified source, plus any pre-existing cumulative increase. United P #51 currently has calculated facility POC emissions of 118.3 tons per year. Therefore, offsets must be provided. At a 1.15 to 1.0 ratio, the offsets required for this application are **1.396 tons/yr**. There is no pre-existing cumulative increase of POC emissions at this facility.

United has agreed to provide the required offsets from Banking Certificate #47.

STATEMENT OF COMPLIANCE:

The Parts Washers S-291, S-292, and S-293 are subject to the Requirements of Regulation 8, Rule 16 “Solvent Cleaning Operations”; Section 303 (Cold Cleaner Requirements) and Section 501 (Solvent Records). From the process description and diagrams provided by United, it appears that the equipment will comply with the Cold Cleaner Requirements listed in 8-16-303.

Permits for “Cold Solvent Cleaning” are considered to be ministerial operations (Permit Handbook Chapter 6.1). Therefore, this application is not subject to CEQA review.

PSD, NSPS, and NESHAPs do not apply.

PERMIT CONDITIONS:

Parts Washers: S-291, S-292, S-293

1. The net solvent usage at each of the Parts Washers S-291, S-292, and S-293 shall not exceed 120 gallons during any consecutive 12-month period. (basis: Cumulative Increase)
2. Before a solvent other than LPS PreSolve or District approved equivalent is to be used at S-291, S-292, and S-293, the owner/operator of this equipment shall first apply for, and be granted by the District, a change of permit conditions. (basis: Toxic Risk Management)
3. In order to demonstrate compliance with the above conditions, monthly records of the type and total amount of make-up solvent used shall be recorded in a District approved log. These records shall be kept on site and be available for inspection by District personnel for a period of at least 5 years from the date on which a record was made. (basis: Cumulative Increase, Toxic Risk Management)

RECOMMENDATIONS:

It is recommended that a permit to operate be issued to United Airlines – SF Maintenance Center for the following:

- S-291: Parts Washer – PV90141; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity**
- S-292: Parts Washer – PV90143; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity**
- S-293: Parts Washer – PV90125; Kleer-Flo Cleanmaster Model 65, 35 gallon capacity**

By: _____
Ted Hull
Air Quality Engineer II

**ENGINEERING EVALUATION REPORT
UNITED AIRLINES SF MAINTENANCE CENTER
APPLICATION NUMBER 006913**

BACKGROUND:

The United Airlines SF Maintenance Center (P# 51) currently operates a chrome plating line consisting of (10) hard chrome-plating tanks (S# 16-25) and a chromic acid anodizing tank (S# 246). Emissions from these sources are captured at each source and vented through a common exhaust system to a dual scrubber abatement system designed to remove hexavalent chromium from the exhaust stream. The scrubber systems normally operate simultaneously in a parallel configuration, but may be isolated from one another if necessary and are each individually capable of providing adequate abatement for the entire chrome plating line. The two scrubber systems are identified as "North" and "South" and consist of the following abatement devices:

North System

A-1: Scrubber #1, PV 14112; Packed Bed Wet Scrubber

A-48: Composite Mesh Pad/Fiberbed Mist Eliminator Combination; Brownian Diffusion type Fibrous Bed Mist Eliminator

South System

A-2: Scrubber #2, PV 14113; Packed Bed Wet Scrubber

A-49: Composite Mesh Pad/Fiberbed Mist Eliminator Combination; Brownian Diffusion type Fibrous Bed Mist Eliminator

In a three stage abatement process, collected gasses from the chrome plating operations first pass through a packed bed wet scrubber, then a composite mesh pad, and finally a high efficiency fiberbed mist eliminator prior to being exhausted to the atmosphere.

The operation of the chrome plating line is subject to the requirements of Regulation 11, Rule 8 and BAAQMD Permit Condition #6465. Regulation 11-8 "Hexavalent Chromium Airborne Toxic Control Measure for Chrome Plating and Chromic Acid Anodizing Operations" adopts by reference the provisions of CCR Title 17, Division 3, Chapter 1, Subchapter 7.5, Section 93102, (i.e. the CARB ATCM for Hexavalent Chromium). Due to unforeseen circumstances, United is operating in violation of ATCM Sections 93102(e)(2) "pressure drop" and (e)(3) "inlet velocity pressure" and Permit Condition #6465 parts 5 and 6, which relate to the ATCM. As a temporary compliance measure, United has sought and was granted a Variance from these requirements under Docket #3416. In order to maintain future compliance, United has applied for a change of permit conditions and to establish "Alternative Requirements" in accordance with ATCM Section 93102(k).

DISCUSSION:

United has violated and/or is currently in violation of the following requirements:

CARB ATCM Section 93102(e)(2) and BAAQMD Condition #6465, part 5

These requirements prescribe the pressure drop range in which add on control devices (in United's case, the Composite Mesh Pad/Fiberbed Mist Eliminators, A-48 and A-49) must operate. Section 93102(e)(2) requires continuous pressure drop monitoring and specifies that the pressure drop must be maintained within ± 1 inch of water of the value established during the complying performance test. Permit Condition #6465, part 5 identifies the specific pressure drop ranges for A-48 and A-49 as required by Section 93102(e)(2).

Permit Condition #6465, part 5 requires that the following pressure drop range be maintained across A-48 and A-49:

- A-48: 5.8 – 7.8 inches of water
- A-49: 5.0 – 7.0 inches of water

United has violated this requirement because the pressure drop across A-48 has exceeded the upper limit of the established pressure drop range.

United has reported that the measured pressure drop across both A-48 and A-49 has slowly been increasing over the past several months and that initial efforts to reverse this trend were unsuccessful. After discussions with the manufacturer, United determined that the increased pressure drop was a result of the normal filling cycle of the filters installed in the fiberbed mist eliminators. Furthermore, Koch –Otto York, the filter manufacturer has documented that the Brownian Diffusion type filters used at A-48 and A-49 have a suggested operating range of 2 – 20 inches of water and that the collection efficiency of the filters increases as the pressure drop increases. Therefore, although a violation of the ATCM and District permit conditions has occurred, it is unlikely that any increase of emissions resulted.

Based on this information, United is requesting that the pressure drop range for A-48 and A-49 be expanded as follows:

- A-48: 2.0 – 18 inches of water
- A-49: 2.0 – 18 inches of water

United has surveyed all other affected components of the scrubber systems and has determined that the proposed pressure drop range is acceptable.

CARB ATCM Section 93102(e)(3) and BAAQMD Condition #6465, part 6

These requirements pertain to the inlet velocity pressure to the Packed Bed Scrubbers A-1 and A-2. Section 93102(e)(3) requires continuous monitoring of the inlet velocity pressure and specifies that it be maintained within ± 10 percent of the value established during the complying performance test. Permit Condition #6465, part 6 identifies the specific inlet velocity pressure range for A-1 and A-2 as required by Section 93102(e)(3).

Permit Condition #6465, part 6 requires that the following inlet velocity pressure range be maintained across A-1 and A-2:

- 0.45 – 0.55 inches of water

Both scrubber systems were in operation during the complying performance test in which the above range was determined and when both systems are operated simultaneously, the inlet velocity pressure is maintained within the prescribed range. However, when one of the scrubber systems is shut down, the recorded velocity pressure falls below the minimum requirement of 0.45 inches of water. United first noticed a violation of this requirement when the North Scrubber System was shut down for filter inspection, leaving the South Scrubber system to operate alone.

The total airflow to the Packed Bed Scrubbers A-1 and A-2 is constant, regardless of whether only one or both are operating and there is no way to divert air around the scrubbers. It is therefore puzzling that the inlet velocity pressure would drop when one of the scrubbers is bypassed, when in fact an increase in inlet velocity pressure would be expected. United believes this low-pressure phenomenon is created by eddy currents in the ducting that shift depending on the operation (or non-operation) of A-1 and A-2. This is a reasonable assumption because the common ducting to A-1 and A-2 is several feet wide and the inlet velocity pressure is measured by a single fixed probe near the center of the plenum. No excess emissions are expected as a result of the inlet velocity pressure irregularities.

Based on the observed inlet pressure velocity ranges when one or the other of the two scrubber systems are not operating, United has suggested that the inlet pressure velocity range be expanded as follows:

- 0.10 – 0.55 inches of water

United has stated that the expanded range will have no effect on the airflow through the scrubber systems.

ALTERNATIVE REQUIREMENTS:

Section 93102(k) allows for the establishment of Alternative Requirements to the Chrome ATCM. For the reasons previously discussed, United has requested alternative requirements to Section 93102(e) Parameter Monitoring; part (2) pressure drop and part (3) inlet velocity pressure. The following is a list of four requirements under Section 93102(k) that must be met in order to establish Alternative Requirements. A statement of compliance follows each requirement.

- (1) Request Approval of an Alternative Requirement.** *Any person may request approval of an alternative requirement. The person seeking such approval shall submit the proposed alternative requirement to the permitting agency for approval. The request must include the proposed alternative requirement, the reason for requesting the alternative requirement, and information demonstrating that the criteria for approval identified in Table (k)(1) is met.*

United is in compliance with this requirement because they have filed a permit application requesting alternative requirements for specific parameter monitoring sections, they have included proposed alternative requirements and the reasons for them, and they have successfully demonstrated that their proposal will not affect compliance with the applicable emissions standard. To further demonstrate that alternative parameter monitoring will not result in increased emissions, a requirement for periodic source testing will be added to the permit conditions for the chrome plating operations.

- (2) Approval of an Alternative Requirement.** *A permitting agency may approve an alternative requirement if it determines that application of the alternative requirement meets the criteria for approval identified in Table (k)(1), and the permitting agency has received concurrence by the U.S. EPA where concurrence is required.*

Table (k)(1), part (e) “parameter monitoring” requires that an alternative requirement provide an equivalent means of determining and assuring compliance. The District and United are confident that expanding the pressure drop ranges for the Composite Mesh Pad/Fiberbed Mist Eliminators A-48 and A-49 to coincide with the manufacturer’s recommendations and changing the inlet velocity pressure range for the Packed Bed Scrubbers A-1 and A-2 to allow for periodic downtime of one or the other of the scrubbers will not lead to increased emissions from the chrome plating operations.

- (3) Concurrence for an Alternative Requirement.** *For those requirements identified in Table (k)(1) as requiring concurrence by the U.S. EPA, the permitting agency shall submit the alternative requirement to the concurring agency prior to final action by the permitting agency.*

In a letter dated March 16, 1999 from David Howekamp, Director – Air Division U.S. EPA Region IX, to Robert Fletcher of CARB, EPA Region IX delegated many of the authorities for approving alternative requirements to the local air districts. Specifically, the requirement for the EPA to concur on district approvals of alternative requirements was eliminated in many cases. EPA Concurrence for parametric monitoring is now only required for major changes, which the EPA defines as follows:

“Major change to monitoring is a modification to federally required monitoring that uses unproven technology or procedures or is an entirely new method (sometimes necessary when the required monitoring is unsuitable). A major change to a test method may be site-specific or may apply to one or more source categories and will usually set a national precedent. Examples of major changes to a test method include, but are not limited to: (1) use of a new monitoring approach developed to apply a control technology not contemplated in the applicable regulation; (2) use of a predictive emission monitoring system (PEMS) in place of a required continuous emission monitoring system (CEMS); (3) use of alternative calibration procedures that do not involve calibration gases or test cells; (4) use of an

analytical technology that differs from that specified by a performance specification; and (5) use of alternate averaging times for reporting purposes.”

Expanding the acceptable ranges for pressure drop and inlet velocity pressure to accommodate specific abatement equipment is clearly not a major change to monitoring as defined above. Therefore, EPA concurrence is not required for the proposed Alternative requirements.

(4) Reports of Approved Alternative Requirements to U.S. EPA. *The permitting agency shall provide the U.S. EPA with copies of all approved alternative requirements. The information shall be provided at a mutually agreed upon frequency.*

The District will provide the U.S. EPA Region IX with a revised copy of the Major Facility Review (Title V) permit. The Title V permit contains all applicable requirements for the facility and will include the alternative requirements. Compliance with the alternative requirements will be certified by United to the District and EPA Region IX on an annual basis in accordance with Section I.G. of the Title V permit.

MODIFIED PERMIT CONDITIONS:

In order to allow for appropriate parameter monitoring of United’s chrome plating line abatement systems, while assuring compliance with the applicable emissions standard, it is recommended that Permit Condition #6465 be modified as show below.

For Sources: 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, (Chrome Plating Tanks), and 246 (Chromic Acid Anodizing Tank)

1. The total annual (net) throughput from the combined chrome plating tanks S-16, 17, 18, 19, 20, 21, 22, 23, 24, 25, and S-246 anodizing tank shall not exceed 109.5 million amp-hr in any consecutive twelve month period. (basis: Toxic Risk Management)
2. These sources shall not be operated unless emissions are vented through either the North Scrubber System, consisting of the A-1 Wet Scrubber and A-48 Composite Mesh Pad/Fiberbed Mist Eliminator (CMP/FBME) or the South Scrubber System, consisting of the A-2 Wet Scrubber and A-48 Fiberbed Mist Eliminator/Composite Mesh Pad (FBME/CMP) or A-49 (FBME/CMP) (CMP/FBME). The ventilation and abatement systems shall be properly maintained and kept in good operating condition. (basis: TBACT)
3. Emissions of hexavalent chromium shall not exceed 0.006 mg/amp-hr after abatement. (basis: Regulation 11-8-93102(c)(1)(A))
4. The differential pressure across each packed-bed wet scrubber (A-1 and A-2) shall be continuously monitored and shall be maintained within the following differential pressure range as established by the most recent BAAQMD approved performance test: (basis: Regulation 11-8-93102 (e)(2))
 - A-1 1.8 - 3.8 inches of water
 - A-2 1.0 - 3.1 inches of water
5. The differential pressure across each ~~fiberbed mist eliminator (FBME) and composit mesh pad (CMP) and fiberbed mist eliminator (FBME) combination (A-48 and A-49)~~ shall be continuously monitored and shall be maintained within the following differential pressure ranges, as established by the most recent BAAQMD approved performance test approved as alternative requirements under Permit Application #6913: (basis: Regulation 11-8-93102 (e)(2))(basis: Regulation 11-8-93102 Table (k)(1)(e))
 - A-48 ~~FMBE/CMPCMP/FBME, 5.8 – 7.8~~ 2.0 - 18.0 inches of water
 - A-49 ~~FMBE/CMPCMP/FBME, 5.0 – 7.0~~ 2.0 - 18.0 inches of water

6. The inlet velocity pressure shall be continuously monitored at the inlet to the ~~wet packed bed scrubbers~~ Packed Bed Wet Scrubbers A-1 and A-2 and shall be maintained within the following velocity pressure range, ~~as established by the most recent BAAQMD approved performance test approved as an alternative requirement under Permit Application #6913: (basis: Regulation 11-8-93102 (e)(3))~~ (basis: Regulation 11-8-93102 Table (k)(1)(e))

0.450.10 - 0.55 inches of water

7. In order to demonstrate compliance with parts 4, 5, and 6 above, the owner/operator of this equipment shall keep the following records in a District approved log. All records shall be kept on site and be available for inspection by District personnel for a period of 5 years from the date on which a record was made. (basis: Regulation 11-8-93102 (h)(4)(B) and (C))

- a. pressure drop across A-1, A-2, A-48, and A-49 on a weekly basis
- b. inlet velocity pressure to A-1 and A-2 on a weekly basis

8. In order to demonstrate compliance with part 1 of these conditions, monthly records of current applied to these sources integrated over time, in units of amp-hrs, shall be kept (onsite) and maintained. Such records shall be submitted to the BAAQMD on an annual basis via the annual update program. These records shall be maintained at the plant site for at least five years.

To comply with the record-keeping requirement, totalizing amp-hr meters shall be installed on all rectifiers serving the chrome plating and anodizing tanks. These amp-hr meters shall be properly maintained and kept in good operating condition. A rectifier shall not be operated unless its associated totalizing amp-hr meter is recording properly. (basis: Toxic Risk Management)

9. In order to demonstrate compliance with the emission limit in part 3, the owner/operator of this equipment shall conduct District approved source testing of both scrubber systems on a bi-annual basis. The initial source test required by this part shall be conducted no later than March 1, 2004. Subsequent testing shall be performed no later than 24 months from the previous test. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report shall be submitted to the Compliance and Enforcement Division and to the Source Test Section within 45 days of the test date. (basis: Regulation 2-1-304)

RECOMMENDATIONS:

It is recommended that the District establish "Alternative Requirements" in accordance with ATCM Section 93102(k) and that Permit Condition #6465 be modified as shown in order to facilitate the implementation of these requirements.

By: _____

Ted Hull
Air Quality Engineer II

APPENDIX B
GLOSSARY

ACT

Federal Clean Air Act

APCO

Air Pollution Control Officer

ARB

Air Resources Board

BAAQMD

Bay Area Air Quality Management District

BACT

Best Available Control Technology

Basis

The underlying authority which allows the District to impose requirements.

CAA

The federal Clean Air Act

CAAQS

California Ambient Air Quality Standards

CAPCOA

California Air Pollution Control Officers Association

CEQA

California Environmental Quality Act

CFR

The Code of Federal Regulations. 40 CFR contains the implementing regulations for federal environmental statutes such as the Clean Air Act. Parts 50-99 of 40 CFR contain the requirements for air pollution programs.

CO

Carbon Monoxide

Cumulative Increase

The sum of permitted emissions from each new or modified source since a specified date pursuant to BAAQMD Rule 2-1-403, Permit Conditions (as amended by the District Board on 7/17/91) and SIP Rule 2-1-403, Permit Conditions (as approved by EPA on 6/23/95). Cumulative increase is used to determine whether threshold-based requirements are triggered.

District

The Bay Area Air Quality Management District

dscf

Dry Standard Cubic Feet

EPA

The federal Environmental Protection Agency.

Excluded

Not subject to any District regulations.

Federally Enforceable, FE

All limitations and conditions which are enforceable by the Administrator of the EPA including those requirements developed pursuant to 40 CFR Part 51, subpart I (NSR), Part 52.21 (PSD), Part 60 (NSPS), Part 61 (NESHAPs), Part 63 (MACT), and Part 72 (Permits Regulation, Acid Rain), including limitations and conditions contained in operating permits issued under an EPA-approved program that has been incorporated into the SIP.

FP

Filterable Particulate as measured by BAAQMD Method ST-15, Particulate.

HAP

Hazardous Air Pollutant. Any pollutant listed pursuant to Section 112(b) of the Act. Also refers to the program mandated by Title I, Section 112, of the Act and implemented by 40 CFR Part 63.

Major Facility

A facility with potential emissions of: (1) at least 100 tons per year of regulated air pollutants, (2) at least 10 tons per year of any single hazardous air pollutant, and/or (3) at least 25 tons per year of any combination of hazardous air pollutants, or such lesser quantity of hazardous air pollutants as determined by the EPA administrator.

MFR

Major Facility Review. The District's term for the federal operating permit program mandated by Title V of the Federal Clean Air Act and implemented by District Regulation 2, Rule 6.

MOP

The District's Manual of Procedures.

NAAQS

National Ambient Air Quality Standards

NESHAPS

National Emission Standards for Hazardous Air Pollutants. See in 40 CFR Parts 61 and 63.

NMHC

Non-methane Hydrocarbons (Same as NMOC)

NMOC

Non-methane Organic Compounds (Same as NMHC)

NO_x

Oxides of nitrogen.

NSPS

Standards of Performance for New Stationary Sources. Federal standards for emissions from new stationary sources. Mandated by Title I, Section 111 of the Federal Clean Air Act, and implemented by 40 CFR Part 60 and District Regulation 10.

NSR

New Source Review. A federal program for pre-construction review and permitting of new and

modified sources of pollutants for which criteria have been established in accordance with Section 108 of the Federal Clean Air Act. Mandated by Title I of the Federal Clean Air Act and implemented by 40 CFR Parts 51 and 52 and District Regulation 2, Rule 2. (Note: There are additional NSR requirements mandated by the California Clean Air Act.)

Offset Requirement

A New Source Review requirement to provide federally enforceable emission offsets for the emissions from a new or modified source. Applies to emissions of POC, NOx, PM10, and SO2.

Phase II Acid Rain Facility

A facility that generates electricity for sale through fossil-fuel combustion and is not exempted by 40 CFR 72 from Titles IV and V of the Clean Air Act.

POC

Precursor Organic Compounds

PM

Particulate Matter

PM10

Particulate matter with aerodynamic equivalent diameter of less than or equal to 10 microns

PSD

Prevention of Significant Deterioration. A federal program for permitting new and modified sources of those air pollutants for which the District is classified "attainment" of the National Air Ambient Quality Standards. Mandated by Title I of the Act and implemented by both 40 CFR Part 52 and District Regulation 2, Rule 2.

SIP

State Implementation Plan. State and District programs and regulations approved by EPA and developed in order to attain the National Air Ambient Quality Standards. Mandated by Title I of the Act.

SO2

Sulfur dioxide

THC

Total Hydrocarbons (NMHC + Methane)

Title V

Title V of the federal Clean Air Act. Requires a federally enforceable operating permit program for major and certain other facilities.

TOC

Total Organic Compounds (NMOC + Methane, Same as THC)

TPH

Total Petroleum Hydrocarbons

TRMP

Toxic Risk Management Plan

TSP

Total Suspended Particulate

VOC

Volatile Organic Compounds

Units of Measure:

bhp	=	brake-horsepower
btu	=	British Thermal Unit
cfm	=	cubic feet per minute
g	=	grams
gal	=	gallon
gpm	=	gallons per minute
hp	=	horsepower
hr	=	hour
lb	=	pound
in	=	inches
max	=	maximum
m ²	=	square meter
min	=	minute
mm	=	million
MMbtu	=	million btu
MMcf	=	million cubic feet
ppmv	=	parts per million, by volume
ppmw	=	parts per million, by weight
psia	=	pounds per square inch, absolute
psig	=	pounds per square inch, gauge
scfm	=	standard cubic feet per minute
yr	=	year