

Participant ID: _____

NIOSH Thermal Spray Coating Project Workplace Survey

*Thank you for your participation and taking time to answer questions about your workplace. The purpose of this survey is to help the [National Institute for Occupational Safety and Health](#) (NIOSH) better understand the thermal spray coating industry and best practices or barriers to occupational safety and health. NIOSH is a federal public health research agency. NIOSH **is not** part of the Occupational Health and Safety Administration (OSHA) and **does not** fine companies for health and safety violations. **The estimated time to complete this survey is 10-30 minutes.***

Does your workplace work in thermal spray coating (TSC), including flame, electric arc, detonation gun, high velocity oxyfuel (HVOF), high velocity air fuel (HVOF), conventional plasma, high energy plasma, vacuum plasma, plasma, radio frequency plasma, or cold spray?

- Yes [continue]
- No [thank you, please exit survey] [**trigger end survey action**]
- I'm not sure [continue]

Section 1: Workplace Information

First, we would like to learn more about your workplace.

Name of company:

Company address:

Industry classification (Name/NAICS Code-6-digit):

About how many people work at this company (including contractors)?

About how many workers perform thermal spray coating?

About how many other workers perform tasks related to TSC such as maintenance, pre-surface preparation, post surface cleaning or finishing?

Public reporting burden of this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to - CDC/ATSDR Reports Clearance Officer; 1600 Clifton Road NE, MS H21-8, Atlanta, Georgia 30333 ATTN: PRA (0920-1434).

Section 2: Production Volume

Next, we would like to learn more about the level of production at your workplace.

About how much time is spent daily on TSC processes?

- Less than 1 hour
- 1 hour and up to 2 hours
- More than 2 hours and up to 4 hours
- More than 4 hours

Has your volume of TSC work increased over the last 5 years?

- No increase in production volume
- Less than 25%
- 25-50%
- 51-75%
- More than 75%

Do you apply the **TSC process** in [select all that apply]:

- Fixed building location
- As a portable unit in a building
- As a portable unit on a structure

Section 3A: Production Practices (TSC processes)

Next, we would like to learn more about the **TSC processes** and materials, tasks performed, engineering controls, and safety measures your workplace uses. Over the next few questions, you will be asked to provide the following information **for each TSC process** currently used at your workplace:

- feedstock material
- amount used annually
- feedstock form (e.g., powder; wire/rod; liquid suspension/liquid precursor)
- fuel, propellants, substrate materials
- structures description of booths or enclosures
- control technologies
- personal protective equipment
- housekeeping

Do you use the electric arc TSC processes at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
- No

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **metals** feedstock material used [select all that apply]: **[triggers 13c and 13d]**

- Nickel
- Chromium
- Manganese
- Cobalt
- Aluminum
- Zinc
- Tin
- Tungsten
- Molybdenum

- Iron
- Copper
- Other (please describe)

Indicate amount used annually: **[dropdown menu] [displayed for each 13b response checked]**

- <100 lbs. per year
- 100 — 500 lbs. per year
- 501 — 1,000 lbs. per year
- 1,001 — 10,000 lbs. per year
- > 10,000 lbs. per year

Indicate form used: **[dropdown menu] [displayed for each 13b response checked]**

- Powder
- Wire/rod
- Liquid suspension/liquid precursor

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **alloys and intermetallics** feedstock material used [select all that apply]: **[triggers 13f and 13g]**

- Stainless steel
- Mild steel
- Nickel-chromium alloys
- Nickel and cobalt alloys
- Ni-Cr-B-Si alloys
- MCrAlY
- TiAl
- Ti3Al
- Ni3Al
- NiAl
- MoS2
- Other (please describe)

Indicate amount used annually: **[dropdown menu] [displayed for each 13e response checked]**

- <100 lbs. per year
- 100 — 500 lbs. per year
- 501 — 1,000 lbs. per year
- 1,001 — 10,000 lbs. per year
- > 10,000 lbs. per year

Indicate form used: **[dropdown menu] [displayed for each 13e response checked]**

- Powder
- Wire/rod
- Liquid suspension/liquid precursor

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **ceramics** feedstock material used [select all that apply]: **[triggers 13i and 13j]**

- Al2O3
- ZrO2
- TiO2
- CrO3
- MgO
- Cr3C2
- TiC
- Mo2C

- SiC
- TiN
- Si₃N₄
- Other (please describe)

Indicate amount used annually: **[dropdown menu] [displayed for each 13h response checked]**

- <100 lbs. per year
- 100 — 500 lbs. per year
- 501 — 1,000 lbs. per year
- 1,001 — 10,000 lbs. per year
- > 10,000 lbs. per year

Indicate form used: **[dropdown menu] [displayed for each 13h response checked]**

- Powder
- Wire/rod
- Liquid suspension/liquid precursor

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **cermet (ceramics/metals)** feedstock material used [select all that apply]: **[triggers 13l and 13m]**

- WC/Co
- Cr₃C₂/NiCr
- TiC/NiCr
- Other (please describe)

Indicate amount used annually: **[dropdown menu] [displayed for each 13k response checked]**

- <100 lbs. per year
- 100 — 500 lbs. per year
- 501 — 1,000 lbs. per year
- 1,001 — 10,000 lbs. per year
- > 10,000 lbs. per year

Indicate form used: **[dropdown menu] [displayed for each 13k response checked]**

- Powder
- Wire/rod
- Liquid suspension/liquid precursor

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **polymers composites** feedstock material used [select all that apply]: **[triggers 13o and 13p]**

- Urethanes
- Ethylene vinyl alcohols
- Nylon 11
- Polytetrafluoroethylene
- Ethylene tetrafluoroethylene
- Polyetheretherketone
- Polymethylmethacrylate
- Polyimid
- Polycarbonate
- Polyvinylidene fluoride
- Other (please describe)

Indicate amount used annually: **[dropdown menu] [displayed for each 13n response checked]**

- <100 lbs. per year
- 100 — 500 lbs. per year

- 501 — 1,000 lbs. per year
- 1,001 — 10,000 lbs. per year
- > 10,000 lbs. per year

Indicate form used: **[dropdown menu]** **[displayed for each 13n response checked]**

- Powder
- Wire/rod
- Liquid suspension/liquid precursor

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **fuel and propellant** used [select all that apply]:

- Argon
- Helium
- Air
- Nitrogen
- Oxygen
- Propane
- Acetylene
- Hydrogen
- Propylene
- Kerosene
- Chemtane 2
- Methane
- Methylacetylene-propadiene propane
- Mixture
- Other (If other fuel and propellants are used, please specify)

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **substrate** material used [select all that apply]:

- Aluminum
- Cobalt
- Copper
- Nickel
- Stainless steel
- Mild steel
- Polymer
- Iron
- Titanium
- Other (If other substrate materials are used, please specify)

For the electric arc [or the type of TSC process asked in the previous question] TSC process, is this TSC process conducted in a temporary containment (e.g., containments using tarps), an enclosed structure (e.g., booths or glovebox), or in a non-enclosed, restricted area? [select all that apply]:

- Glove box
- Field portable glove box
- Fully enclosed booth
- Partially enclosed booth
- Temporary containment
- No booths
- Restricted area, non-enclosed

- Other (If other types of containment are used, please specify)

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the types of **exhaust ventilation** used for this process [select all that apply]:

- Mechanical exhaust ventilation [select all that apply]: **[subcategories displayed if selected]**
 - HEPA filter
 - Dry filter
 - Wet scrubber
 - Water curtain
 - Other (If other types are used, please specify)
- Portable exhaust ventilation [select all that apply]: **[subcategories displayed if selected]**
 - HEPA filter
 - Other (If other types are used, please specify)
- No mechanical exhaust ventilation

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the **Personal Protective Equipment (PPE)** available at your workplace [select all that apply]:

- NIOSH-approved N95 respirator
- Half-face respirator (select all that apply) **[subcategories displayed if selected]**

For the half-face respirator, please select type(s) of filter(s) used

- Particulate filter
- Organic vapor cartridge
- Combination
- Unsure
- Full-face respirator (select all that apply) **[subcategories displayed if selected]**

For the full-face respirator, please select type(s) of filter(s) used

- Particulate filter
- Organic vapor cartridge
- Combination
- Unsure
- Powered air-purifying respirator (PAPR)
- Other PPE (select all that apply) **[subcategories displayed if selected]**
 - Gloves
 - Protective glasses or goggles
 - Coveralls
- Other (please describe other PPE available)

For the electric arc [or the type of TSC process asked in the previous question] TSC process, please select the enclosures and TSC equipment that are cleaned in your workplace [select all that apply]:

- Glove box
- Booth
- Temporary containment
- Other (please describe other type of enclosure or equipment cleaned)

Indicate how often this enclosure or equipment is cleaned. **[dropdown menu] [displayed for each 13v response checked]**

- Daily
- Weekly
- Monthly
- Annually

- Not cleaned

[After completing the group of questions above related to the electric arc TSC process, REDCap will move to the next question, asking if respondents use different type(s) of TSC processes]

Do you use the flame TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the high velocity oxyfuel (HVOF) TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the conventional plasma TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the high energy plasma TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the vacuum plasma TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the radio frequency plasma TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b - 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the detonation gun TSC process at your facility?

- Yes **[triggers 13b - 13w to be displayed if the answer is Yes]**
 No

[If the answer is Yes, REDCap will trigger questions 13b – 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use the cold TSC process at your facility?

- Yes **[triggers 13b – 13w to be displayed if the answer is Yes]**
- No

[If the answer is Yes, REDCap will trigger questions 13b – 13w above. If the answer is No, REDCap will move to the next question as follows]

Do you use any other TSC process at your facility?

- Yes
Please describe the other TSC process used: **[triggers 13b – 13w to be displayed if the answer is Yes]**
- No

[If the answer is Yes, REDCap will trigger questions 13b – 13w above. If the answer is No, REDCap will move to the next question]

Section 3B: Production Practices (Others)

Select the housekeeping methods currently used in your workplace? [select all that apply]:

- HEPA-filtered vacuuming
- Dry sweeping
- Compressed air
- Wet sweeping
- No housekeeping procedures
- Other (please indicate any other housekeeping procedures used)

Which **surface preparation tasks** do you perform before TSC is applied? [select all that apply]

- Roughening
- Deburring
- Chamfering
- Radiusing edges
- Preheating
- Masking (high temp tape, paint-on, metal shadow)
- Abrasive grit blasting
- Other surface repair
- Bond coating
- Wet abrasive blasting
- Dry abrasive blasting
- Stripping coating
- Other methods (please indicate any other surface preparation tasks you perform)

Which **surface cleaning methods** do you apply before or after TSC is applied? [select all that apply]

- Solvent-based degreasing **[subcategories displayed if selected]**
For solvent-based degreasing, please select type(s)
 - Methyleneethyl ketone
 - Acetone
 - Acetic acid

- Phosphoric acid
- Polyphosphates
- Orthosilicates
- Other (please indicate any other type of solvent-based degreasing applied)
- Thermal cleaning
- Other (please indicate any other surface cleaning method applied)

Which **surface finishing method** do you apply after TSC is applied? [select all that apply]

- Surface finishing [**subcategories displayed if selected**]
 - Grinding
 - Vibratory finishing
 - Lapping
 - Brush finishing
 - Diamond belt
 - Turning
- Heat treating [**subcategories displayed if selected**]
 - Vacuum heat treat
 - Heat tint
 - Furnace treat in air
 - Furnace treat in inert
- Sealing [**subcategories displayed if selected**]
 - Sealant infiltration
 - Release/non-stick
 - Paint/urethane
- Densification [**subcategories displayed if selected**]
 - Shot peening
 - Heat treatment
- Gauging and inspection [**subcategories displayed if selected**]
 - Thickness
 - Roughness
 - Fluorescent penetrant
 - Temperature
 - Hardness
 - Microstructure
 - Density
- Other (please describe other surface finishing method)

Section 4: Industry Practices

What industries do you do business with (i.e., manufacture or repair parts for or sell to)? [select all that apply]

- | | |
|--|---|
| <input type="checkbox"/> Aero gas turbines | <input type="checkbox"/> Computers |
| <input type="checkbox"/> Agriculture implements | <input type="checkbox"/> Defense and Aerospace |
| <input type="checkbox"/> Architectural | <input type="checkbox"/> Diesel engines |
| <input type="checkbox"/> Automotive engines | <input type="checkbox"/> Electrical and electronics |
| <input type="checkbox"/> Business Equipment | <input type="checkbox"/> Electrical utilities |
| <input type="checkbox"/> Cement and structural clays | <input type="checkbox"/> Food processing |
| <input type="checkbox"/> Chemical processing | <input type="checkbox"/> Forging |
| <input type="checkbox"/> Copper and brass mills | <input type="checkbox"/> Glass manufacture |

- Hydro-steam turbines
- Iron and steel casting
- Iron and steel manufacture
- Land based gas turbines
- Marine manufacture and repair
- Metal working
- Medical
- Mining, construction and dredging
- Nuclear
- Oil and gas exploration
- Offshore Applications
- Printing equipment
- Pulp and paper
- Petrochemicals
- Pumps/motors
- Railroad
- Rock products
- Rubber and plastic manufacture
- Refineries
- Screening
- Ship and boat manufacture and repair
- Steel and rolling mills
- Textile
- Transportation non-engine
- Utilities
- Other (please indicate other type of industry you do business with)

Does your workplace have a written Respiratory Protection Program?

- Yes (Ask question 20)
- No (Skip to question 22)
- Don't know (Skip to question 22)

Are workers fit-tested for the selected respiratory protection?

- Yes (Ask question 21)
- No (Skip to question 22)
- Don't know (Skip to question 22)

Is respirator training provided to production workers?

- Yes
- No
- Don't know

Are medical evaluations ever provided for workers?

- Yes (If yes, open frequency options below)
 - At hire
 - Annually
 - Other (please describe other frequency):
- No
- Don't know

Has air monitoring for particles (metals or dust) and/or gases ever been performed at your company?

- Yes
- No
- Don't know

Section 5: Future Participation

Would you be interested in helping NIOSH learn how to better protect worker health and safety by partnering with NIOSH to perform industrial hygiene sampling or medical surveillance of production workers? This would be entirely free

to the company. **If you choose to participate, NIOSH will protect your identity, your coworker's identity, and the name of your company to the extent allowed by law.**

Yes

No

Maybe

*We would like to collect workplace contact information. This information is to assist NIOSH in contacting your workplace should you request additional information from NIOSH. Nevertheless, provision of your information listed below is voluntary. **NIOSH will not directly identify you or your workplace in any of our study findings.***

First Name:

Last Name:

Work phone number:

Work email address:

Thank you for your participation and for taking the time to answer these questions. If you have questions about the survey or would like to speak with someone at NIOSH, please contact: Emily Lee elee2@cdc.gov or Abbas Virji MVirji@cdc.gov.