3 - AR No. 1 - Increase Paint Spray Efficiency

Recommendation

Train personnel to reduce overspray in paint application. The reduction of overspray will reduce associated paint consumption by 15%, or $7,430 annually.

Annual Savings Summary

Source	*Quantity*	*Units*	*Cost Savings*
Paint Consumption	92	gal	$5,186
Primer Consumption	87	gal	$2,244
Total	**179**	**gal**	**$7,430**

Implementation Cost Summary

Description	*Cost*	*Payback (yrs)*
No Incentives Found	$1,495	0.2

Facility Background

Each product produced by the facility is painted in the painting booth. Annual paint and plastic primer usage totals 1,676 gallons for an annual expense of $54,432. According to facility personnel, painters do not receive any paint training, which results in occasional poor paint jobs and overspray as the painters do not learn proper spray technique. Analysts noticed significant paint accumulation on the walls of the paint booth which, according to facility personnel, is due to overspray. Facility personnel expressed interest in a paint training program which could reduce paint usage.

Opportunity Background

Overspray occurs when more paint is sprayed than necessary, resulting in paint build-up on the surrounding walls. Operator spray technique and equipment settings can be improved to reduce paint overspray. Reduced overspray saves paint, extends booth filter life, and reduces waste. The Pacific Northwest Pollution Prevention Resource Center (NPPRC) provides Spray Technique Analysis and Research (STAR) training to painters [1]. This training is dedicated to improving overall effectiveness of manual spray coating techniques and considers system efficiency, thickness of coating applied to parts, importance of gun adjustment, equipment maintenance, and proper spray gun distance and orientation. Research in the automotive collision repair industry has shown that the most experienced painters improved their paint transfer effectiveness by 5% to 25%. One particular manufacturer adjusted spraying techniques to improve transfer efficiency for lacquer and primer after training by 20% and 8%, respectively. In this case, booth filter use was reduced by 50%, resulting in additional cost savings.

3 - AR No. 1 - Increase Paint Spray Efficiency

Proposal

Reduce paint and plastic primer consumption by training painters to reduce overspray. Reduction of overspray will save 179 gallons of materials annually. Cost savings are estimated at $7,430 per year after an implementation cost of $1,495, resulting in a simple payback period of 0.2 years.

Incentives

This recommendation does not reduce energy consumption and will likely not qualify for typical incentives. This does not necessarily mean no incentives are available; custom incentives can sometimes be arranged.

Calculation Methodology

Facility personnel provided annual consumption and cost data of paint, plastic primer, and reducer/filler. Unit of each material cost was calculated by dividing the total material expense by the total material volume usage. The savings were estimated as 15% of the total cost of materials per year.

Notes

Additional savings are possible with the reduction of filters used in the paint booths, but was not included in this recommendation due to insufficient cost data for filters from the facility.

In order to maximize savings over time, analysts recommended that paint training be repeated regularly.

A mid-range savings value of 15% was chosen based on the workers having no prior training of proper spray techniques, resulting in a large potential spray efficiency increase. Painters will need to implement new techniques learned to achieve estimated savings.

References

[1] "Spray Painting Efficiency Training (STAR & NESHAP)." PPRC Spray Painting Efficiency Training. [Online]. Available: http://pprc.org/index.php/2012/projects-2/projects/spray-painting-training-efficiency/. [Accessed: Feb. 12, 2018].

3 - AR No. 1 - Analysis

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Original Template May 2016, style 2013b

General Data

Material Cost

Paint	(C_P)	*$56.68*	/gal	**(N. 1)**
Plastic Primer	(C_{PP})	*$25.79*	/gal	**(N. 1)**

Material Quantity

Paint	(Q_P)	*610*	gal/yr	**(N. 1)**
Plastic Primer	(Q_{PP})	*580*	gal/yr	**(N. 1)**

Paint Spray Training

Proposed Paint Reduction	(R)	*15%*	/yr	**(N. 2)**

Paint Analysis

Current Conditions

Material Consumption	(n_C)	*1,190*	gal/yr	**(Eq. 1)**
Material Cost	(C_C)	*$49,533*	/yr	**(Eq. 2)**

Proposed Conditions

Material Consumption	(n_P)	*1,012*	gal/yr	**(Eq. 3)**
Material Cost	(C_P)	*$42,103*	/yr	**(Eq. 4)**

Savings

Material Savings	(n_S)	*179*	gal/yr	**(Eq. 5, N. 2)**
Cost Savings	(C_S)	*$7,430*	/yr	**(Eq. 6, N. 2)**

Equations

Eq. 1) Current Material Consumption (n_C)

$$Q_P + Q_{PP}$$

Eq. 2) Current Material Costs (C_C)

$$(C_P \times Q_P) + (C_{PP} \times Q_{PP})$$

Eq. 3) Proposed Material Consumption (n_P)

$$n_C(1-R)$$

Eq. 4) Proposed Material Cost (C_P)

$$C_C(1-R)$$

Eq. 5) Material Savings (n_S)

$$n_C - n_P$$

Eq. 6) Cost Savings (C_S)

$$C_C - C_P$$

Notes

N. 1) Information on unit cost provided by facility personnel in an itemized spreadsheet of material costs.

N. 2) The paint reduction percentage is based on a mid-range estimate from prior paint efficiency training. Prior reduction values varied between 5% and 25% depending on the training's effectiveness and prior training [1].

3 - AR No. 1 - Implementation

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Implementation Cost Analysis

Training Costs

Paint Efficiency Base Training	(C_B)	***$1,295***	/session	**(N. 4, Rf. 1)**
Training Expenses	(C_E)	***$200***	/session	**(N. 4, Rf. 1)**

Economic Results

Annual Cost Savings	(S)	***$7,430***	/yr	**(N. 5)**
Implementation Cost	(C_I)	***$1,495***		**(Eq. 7)**
Simple Payback	(t_{PB})	***0.2***	yr	**(Eq. 8)**

Equations

Eq. 7) Implementation Cost (C_I)

$$C_B + C_E$$

Eq. 8) Simple Payback (t_{PB})

$$\frac{C_I}{S}$$

Notes

N. 4) One session should be enough to yield results, but additional sessions could further support successful implementation.

N. 5) Developed on a previous page of this recommendation.

3 - AR No. 1 - Data Preparation

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Data Collected

Heading 3

Heading 4	Variabl	*Input*	Units	**(Rf. 1)**
Heading 4	Variabl	*Input*	Units	**(Rf. 1)**
Heading 4	Variabl	*Input*	Units	**(Rf. 1)**

Properties

Heading 3

Heading 4	Variabl	*Calc*	Units	**(N. 1)**
Heading 4	Variabl	*Calc*	Units	**(Eq. 1)**
Heading 4	Variabl	*Calc*	Units	**(Eq. 2)**

Heading 3

Heading 4	Variabl	*Calc*	Units	**(N. 2)**
Heading 4	Variabl	*Calc*	Units	**(N. 3)**

Climate Data

Heading 4	
Heading 4	
Heading 4	

Energy Analysis

Current Conditions

Heading 4	Variabl	*Calc*	Units	**(N. #, Eq. #)**
Heading 4	Variabl	*Calc*	Units	**(Eq. #)**
Heading 4	Variabl	*Calc*	Units	**(Eq. #)**
Energy Consumption	(E_C)	*Calc*	Units	**(Eq. #)**

Proposed Conditions

Heading 4	Variabl	*Calc*	Units	**(Eq. #)**
Heading 4	Variabl	*Calc*	Units	**(Eq. #)**
Heading 4	Variabl	*Calc*	Units	**(Eq. #)**
Energy Consumption	(E_P)	*Calc*	Units	**(Eq. #)**

Equations

Eq. 1) Current Paint Consumption (n_C)

$$Q_P + Q_{PP} + Q_M + Q_R$$

Eq. 2) Current Paint Costs (C_C)

$$(C_P \times Q_P) + (C_{PP} \times Q_{PP}) + (C_M \times Q_M) + (C_R \times Q_R)$$

Eq. 3) Proposed Paint Consumption (n_P)

$$n_C(1-R)$$

Eq. 4) Proposed Paint Cost (C_P)

$$C_C(1-R)$$

Eq. 5) Paint Savings (n_S)

$$n_C - n_P$$

Eq. 6) Cost Savings (C_S)

$$C_C - C_P$$

Eq. 7) Implementation Cost (C_{IT})

$$C_B + C_E$$

Eq. 8) Simple Payback (t_{PB})

$$\frac{C_I}{S}$$

Notes

3 - AR No. 1 - Analysis

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Key Input Data

Reccomendation Data

Current Operation Time	(t_C)	*8,760*	hrs./yr.	**(N. 1)**
Current Energy Consumption	(E_C)	*100.0*	MMBtu	**(N. 2)**
Proposed Energy Consumption	(E_P)	*50.0*	MMBtu	**(N. 2)**

Utility Data

Incremental Natural Gas Cost	(IC_E)	*$0.0500*	/MMBtu	**(N. 3)**
Incremental Demand Cost	(IC_D)	*$5.00*	/kW·mo.	**(N. 3)**

Energy Analysis

Current Conditions

Current Energy Consumption	(E_C)	*100*	MMBtu	**(N. 2)**
Current Energy Cost	(C_C)	*$5*	/yr.	**(Eq. 1)**

Proposed Conditions

Proposed Energy Consumption	(E_P)	*50*	MMBtu	**(N. 2)**
Proposed Energy Cost	(C_P)	*$3*	/yr.	**(Eq. 1)**

Savings

Energy Savings	(E_S)	*50*	MMBtu	**(Eq. 2)**
Cost Savings	(S)	*$3*	/yr.	**(Eq. 3)**

Equations

Analysis Equations

Eq. 4) Energy Cost (C)

$$E \times IC$$

Eq. 5) Energy Savings (ES)

$$E_C - E_P$$

Eq. 6) Cost Savings (S)

$$S_C - S_P$$

Notes

N. 1) Current operating hours of the energy consuming system.

N. 2) Developed on the Data Preparation page of this recommendation.

N. 3) Developed in the Utility Analysis section of this report.