

System Review

Instruction guide for initial pre-audit and annual system review

The System Review is a potent and cost-effective tool that guides you step-by-step through all necessary points that must be checked during the initial pre-audit, and then annually. It is most effective when used on a mobile device (tablet or smartphone) via the CALMS application.

Note: Always ask the customer for permission before taking pictures.

Follow Review steps:	Notes	System details	Efficiency	Reliability	Potential Savings
I ONOW INCONCINE SLEPS.					

- 1. Begin the compressed air system review with an introductory meeting, then proceed to the compressor room. Record any issues with the compressed air system, and photograph the entire installation before continuing with the distribution and demand-side inspection (this may also be part of a waste-leak audit).
- 2. **Notes:** Discuss with the customer any identified issues with the compressed air system. Utilize predefined and user (expert only) predefined questions.
- 3. System details: Fill out the System Details page and note the equipment in the compressor room: record compressor data, take pictures of name-plates and panels document dryer data, take pictures of nameplates and HMI gather receiver data and photograph receivers with a pressure gauge. Also, photograph the compressor room and PI&D schematics or sketch them in Setup -> schematics.
- 4. Efficiency: Complete the System Efficiency page.
- 5. **Reliability**: Fill in the System Reliability page.
- 6. **Potential savings**: Correct if necessary auto-suggested savings and estimate %savings. Generate a System Review report.
- Optional: Conduct a waste audit: carry out a leak survey using a selected ultrasound detector identify artificial demands - spot inappropriate uses - add significant compressed air users with data.

Note: All data and fields must be fulfilled otherwise system review is incomplete.



1 Content

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2 Open new or existing system

Create new system (only for CALMS partners) under Manager menu select Create new system.

In case system is already created select the system under System menu.

- Open Review under Assessment
- + New review (we recommend to set end on date with duration of 1 year)



3 Notes

Start with Notes menu, select with + predefined questions, problems or write own. Purpose of notes is to get list of opportunities, record information about the system. Take and link pictures, sort notes and return to notes whenever needed during system review.





4 System details

1.Collect system data,

2. With link check major **system setup** and create **PI&D schematics**, draw PI&D under **Setup/Equipment** menu with as many data and pictures of equipment as possible (based on linked pictures you can enter data later). Return back to System review.

3. Enter the **compressor data** (if PI&D is completed all the data will copy to this page), use loaded/unloaded hours to estimate operation to estimate annual consumption.

4.Record **Compressed air cost** from customer books, with help of CALMS calculator or CALMS TCO tool.

5.Under **Estimation** use Auto or enter manual data for annual consumption to estimate system efficiency and compare to the best in class based on system data.

≡ ← Review 2023-08-05 Note	es System details Efficie	ncy Reliability	Potential Sav	ings				5		A 6
Save 🖳 Report 🖍 Edit										
System data										
Annual operating hours Electricity cost C02 emission	8760 h 0.08 \$ /kWh 0.22 kg/kWh	?		Max operating pressure Pressure setpoint Min operating pressure Dryer type Compressed air system		0 0 No dryer Oil flooded	psi psi ¢ O Oli f	ree		
Check system setup, PI&D diagram and	target KPIs Open 🗹									
Compressor data				Provide a state						
				Reporting period	Hour	s in last year \$				
Tag Name - model OEM		Year of manufacture	Nominal power	Running hours	Loaded hours	Unioaded hours	Utilisation rate average output	Annual consum		
C.01	Fixed speed	Required field.	Required field.	kW D Required field.	Required field.		0 1) %	0 k'	Wh 📋
ADD COMPRESSOR									Total: 0 k	Wh
Compressed air cost 📾	0.000095 \$ /US gal Fill from tot	I cost of ownership	open 🕑							
Estimation 😧										
Auto										
Annual energy consumption: Annual air consumption:		0 kWh 0 US gal		verage power: verage flow:				0 kW 0 cfm		
Specific power:				Best in class syste	em - based on speci	fic power				
Electrical cost for compressed air per year: Total compressed air cost per year: Annual environmental footorint CO2:		\$0.00 \$0.00 0 t				\$0.00 \$0.00		\$0.00 \$0.00		



5 Efficiency

1.Collect data for overall efficiency score with highlighting the answers

Note: All questions must be answered

2. Press **Edit answers** button to start replying with selecting (click on the most appropriate answer), when all is selected press **Lock answer&save** button to save.

3. For each question you can use 3 icons: **Edit comment** for detail explanation, remarks, **Add images** to take some photos related to and **Marks as not applicable** in case this point is not relevant or applicable for this system

← Review 2023-08-05 Notes System details	Efficiency	Reliabili	y Potential Savings				3 O E
e T. Report 🖌 Edit							
				Overall efficiency score			
			Po	Eceller			
			:	Score: 5.2% - 81.9%			
COCK ANSWERS & SAVE	show missing						
Supply side score: 15.6% - 65.6%							
feat recovery		E 0	None	HRC on 25% of compressors	HRC on 50% of compressors	HRC on 75% of compressors	HRC for complete system
ystem capacitance - storage (m3 or cf) as a percentage of normal perating flow (m3/min or cfm)	•	E 0	Less than 20%	20-40%	40-60%	60-80%	More than 80%
ompressor control method	•		Bypassing or Online / Offline - high cycling Sx min	Modulation or Online / Offline - high cycling 2x min	Online / Offline - high cycling 1x min	Online / Offline - low cycling less than 1x mi	Variable speed drive
system control method			Local only		Simple sequencer		Master controller
low controller			No flow controller		Flow controller		Flow controller with remote monitor
Dryer type			No dryer	Heatless desiccant	Heated desiccant	Refrigerated	Heat of compression
Pressure drop across air treatment			More than 0.7 bar (10 psi)	0.5 bar (8 psi)	0.4 bar (6 psi)	0.3 bar (4 psi)	Less than 0.2 bar (3 psi)
ondensate management	•	•	Hand valves / cracked or opened		Timed drains	No-loss drains not checked	No-loss drains regularly checked
Distribution side score: 0.0% - 80.0%							
Excessive pressure in distribution line or working pressure above minimum required (valid for instrument air 6-10 bar / 85-145 psi)		E 0	+ 2 bar (20 psi)	+ 1.5 to 2 bar (15 to 20 psi)	+ 1 to 1.5 bar (10 to 15 psi)	+ 0.5 to 1 bar (7 to 10 psi)	+ 0.5 bar (7 psi)
Main pipeline size / flow speed 📓			More than 20 m/s (65 f/s)	18 m/s (60 f/s)	15 m/s (50 f/s)	12 m/s (40 f/s)	Less than 10 m/s (32 f/s)
Pipeline ring				No		Yes	
iping material			Corroded steel	Carbon steel	Non metallic	Aluminium	Stainless steel
ressure drop in distribution piping	•	•	More than 0.7 bar (10 psi)	0.5 bar (8 psi)	0.4 bar (6 psi)	0.3 bar (4 psi)	Less than 0.2 bar (3 psi)
Demand side score: 0.0% - 100.0%							
eak management program		• •	Not maintained	Occasional	Spot maintenance	Routine maintenance	Sustainable program
eak rate %: (Leak flow / Avg. flow)		• •	More than 40%	35%	30%	20%	Less than 10%
nappropriate use awareness / management			None evident		Occasional		Sustainable program
rtificial demand awareness / management			None evident		Occasional		Sustainable program



6 Reliability

1.Collect data for overall reliability score with highlighting the answers

Note: All questions must be answered

2. Press **Edit answers** button to start replying with selecting (click on the most appropriate answer), when all is selected press **Lock answer&save** button to save.

3. For each question you can use 3 icons: **Edit comment** for detail explanation, remarks, **Add images** to take some photos related to and **Marks as not applicable** in case this point is not relevant or applicable for this system

Review 2023-08-05 Notes System details Report Fait	Efficiency	- Cen	ability F	totential Savings				9 e e
a Related Education								
					Overall reliability score			
				Fox	C.cies			
				S	core: 35.4% - 74.4% Corrective action recommended			
EDIT ANSWERS	missing							
	mooning							
Compressor room score: 50.0% - 64.3%			0			Cational		Up to date
2&I diagram & project documentation			None None	firmed 8 and second study (bird)		Outdated		Up to date
compressor room temperature				nitored & not regulated (high)		Monitored	Annual sectors	Monitored and regulated (low)
invironment / cooling air quality	•		High du		Dust / dirty	Some dust / moderate	Some dust / clean	No dust / clean
pace for maintenance / access fork, crane	•			an 1m (3ft), no		1m (3 ft), yes		More than 1m (3ft), yes
compressor station maintenance checklist	•		None			Sporadic checklist updates		Daily checklist entrances
pare connection for rental equipment-expansion	•		Ø No					Yes
ssessment - Audit	•	2	Not reca	ano.u		Before new investment		Yearly, independent expert
Compressors score: 54.2% - 70.8%								
Age in years (oldest running)			More th		13 - 15	8-12	5-7	Less than 5
Aaintenance			Break /		Ad hoc	Service intervals	Preventive maintenance	Service contract & preventive maintenar
Overhauls or hours of operation since last overhaul			More the	an 2x or 60,000h	2x or 50,000 to 60,000h	1x or 35,000 to 50,000h	0x or 20,000 to 35,000h	0x or less than 20,000h
lack up - redundancy %capacity of largest compressor			O Less the	an 50%		100%		More than 150%
Remote monitoring, diagnostic			None			Alert notification only		Remote monitoring & preventive notifica
Compressor start/stops or load/unload	•		 High cy unloads 	cling more than 10 stops/h or 5 //min		Moderate cycling 5 stops/h or 3 unloads/min		Low cycling less than 1 stop/h or 1 unload/min
Nr treatment score: 37.5% - 62.5%								
Age in years (oldest running)		27	More th	an 15	13 - 15	8-12	5-7	Less than 5
Aaintenance	-		Break /		Ad hoc	Service intervals	Preventive maintenance	Service contract & preventive maintenar
Back up - redundancy %capacity of largest unit			 Less thi 			100%		More than 150%
Bypass installation	-		None		Partially	Dryers and filters collectively		Dryers and filters separately
ilter element replacement				on recalled, no dP indicator	Partiany	Replaced as per service interval / no d indicator	p	Replaced as per service interval or dP indicator
Condensate drains service		2	No actio	on recalled		Checked weekly		Checked daily
Nil water separator service	-		-	on recalled	When broken or advised	Service interval		Per service interval or annually
	-		No activ		6y ago	5y ago	4y ago	Sample or 3y ago
Desiccant change		-	0		-7			
tesiccant change			0		-7-8-			



7 Potential savings

1.Check all actions, estimated compressed air cost and correct selection of **Potential** actions Yes/No and correct estimated **potential savings %.**

2. Create **Report** with using of existing template and you can always modify report with additional sections, comments, pictures...to deliver best representation on system review

T Report Edit						
		×				
mated potential savings based on review						
				•		
			ECHANICAL 5%			
ectrical cost for compressed air per year	\$0.00	A	IR OUTPUT 15%		COMPRESSED AIR	
tal compressed air cost per year	\$0.00				USEFUL PRODUCTION	
		ENERGY INPUT 100%			IMPROVEMENTS	
					GENERATION DISTRIBUTION	
					Leaks	
					Inappropriate use	
					Artificial domand	
				>	~ ~ ~ ~	> > > >
				A-CA-03	CA-6 CA-6	-CA-0
						~ 0 0 0
No. Action group			Potential Yes/No	Potential saving % 🕢	Potential savings based on EU study Potentia	al savings estimati
_01	ement			12 %	16%	
_02 Ø Overall system design, decrease of system pres	ssure, including multi-pressure, equipment size		0	1.5 %	4.5%	
_03 Recovery of waste heat, heat recovery systems				36 %	4%	
				36 %	4%	
_04 Improvement of drives (Adjustable speed drives	s, VSD, ASD)		8			1
_04 Improvement of drives (Adjustable speed drives	s, VSD, ASD) partially loaded compressors		8	1.8 %	2.8%	1
Improvement of drives (Adjustable speed drives Of O Use of sophisticated control systems, reducing g Upgrading of compressor, new more efficient tee	i, VSD, ASD) partially loaded compressors cheology		2 	3.8 % 2.4 %	3.8%	:
O4 O Improvement of drives (Adjustable speed drives O5 O Use of sophisticated control systems, reducing O Upgrading of compressor, new more efficient te O7 O Optimizing certain end use devices and remove	r, VSD, ASD) partially loaded compressors cheology inappropriate air applications		2 2 2 3 2 3 3	1.8 % 2.4 % 2.1 %	3.8% 2.4% 2.1%	1
L94 D Improvement of drives (Adjustable speed drives L95 Use of sophisticated control systems, reducing Use of sophisticated control systems, reducing Use of sophisticated control systems, reducing D Optimizing certain end use devices and remove L97 O Optimizing certain end use devices and remove L98 Reducing frictional pressure losses, pressure dro	r, VSD, ASD) partially loaded compressors cheology inappropriate air applications			1.8 % 2.4 % 2.1 %	3.8% 2.4% 2.1% 2%	5 5 5 5 5
bal barprovement of drives (Adjustable speed drives barger b	s, VSD, ASD) partially loaded compressors chrology insporopriate air applications ops, pipings, valves		2 2 2 3 2 3 3	1.8 % 2.4 % 2.1 % 2 %	2.8% 2.4% 2.1% 2% 1.6%	: : : : : :
More the second se	s, VED, ARD) partially loaded compressors chronology inappropriate air applications ops, pipings, valves HEM, IMOP)		5 5 6 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	18 % 24 % 21 % 2 % 3.6 2 % 3.5 %	245 245 255 765 1.05	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Load Improvement of drives (Adjustable speed drives Use of sophisticated control systems, reducing Use of sophisticated control systems, reducing Of Upgrading of compressor, new more efficient te Of Optimizing certain end use devices and remove Reducing frictional pressure losses/pressure dre OP More frequent filter registement Inprovement of drives (high efficiency motors, 1, Inprovent of drives (high efficiency motors, 1, Inproved cooling, drying, filtering and condensa	s, VED, ARD) partially loaded compressors chronology inappropriate air applications ops, pipings, valves HEM, IMOP)		0 8 0 9 1 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	aa x 24 x 21 x 2 x 26 2 x 35 x 24 x	245 245 255 145 135 045	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
D4 Improvement of drives (Adjustable speed drives D5 Use of sophisticated control systems, reducing D6 Use of sophisticated control systems, reducing D7 Optimizing ortain and use devices and remove D8 Reducing frictional pressure losses, pressure drives D9 More frequent filter reglacement O1 OP Improvement of drives (high efficiency motors, h 11 OP Improved cooling, drying, filtering and condensa 12 P Installation of flow controller (CFC)	i, VBD, ASD) partially loaded compressors chrology inappropriate air applications ops, pipings, valves HEM, IMOP) HEM, IMOP			aa s, 24 s, 1 s, 2 s, 2 s, 2 s, 2 s, 2 s, 2 s, 2 s, 2	245 245 255 145 135 045	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Los Improvement of drives (Adjustable speed drives Adjustable speed drives Wae of sophisticated control systems, reducing j Use of sophisticated control systems, reducing j Optimizing of compressor, new more efficient te Affect Optimizing certain end use devices and remove Optimizing Optimizing certain end use devices and remove Optimizing Optimizing certain end use devices and remove Optimizing Optimizi	I, VED, ASD) partially loaded compressors partially loaded compressors insaperoprise air applications pps, piprigs, valves eteX, (MOP) eteX, (MOP) and dry)			aa k 24 k 10 k 20 k 20 k 20 k 20 k 20 k 20 k 20 k 2	245 245 215 25 145 135 0,85	
Los Improvement of drives (Adjustable speed drives Adjustable speed drives Wae of sophisticated control systems, reducing j Use of sophisticated control systems, reducing j Optimizing of compressor, new more efficient te Affect Optimizing certain end use devices and remove Optimizing Optimizing certain end use devices and remove Optimizing Optimizing certain end use devices and remove Optimizing Optimizi	I, VED, ASD) partially loaded compressors partially loaded compressors insaperoprise air applications pps, piprigs, valves eteX, (MOP) eteX, (MOP) and dry)			a	245 245 215 25 145 135 0,85	
DA Disprovement of drives (Adjustable speed drives Dispersion of drives (Adjustable drives) Dispersion of drives Dispersion Disper	L, VED, ARD) partially loaded compressors inappropriate air applications opp, ppinge, valves HEM, IMCP) HEM, IMCP and dry) and dry)			a	245 245 215 25 145 135 0,85	
DA Disprovement of drives (Adjustable speed drives Dispersion of drives (Adjustable drives) Dispersion of drives Dispersion Disper	L, VED, ARD) partially loaded compressors inappropriate air applications opp, ppinge, valves HEM, IMCP) HEM, IMCP and dry) and dry)			a 5 b 5 b 2 c 5 c 2 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5 c 5	245 245 215 25 145 135 0,85	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1