

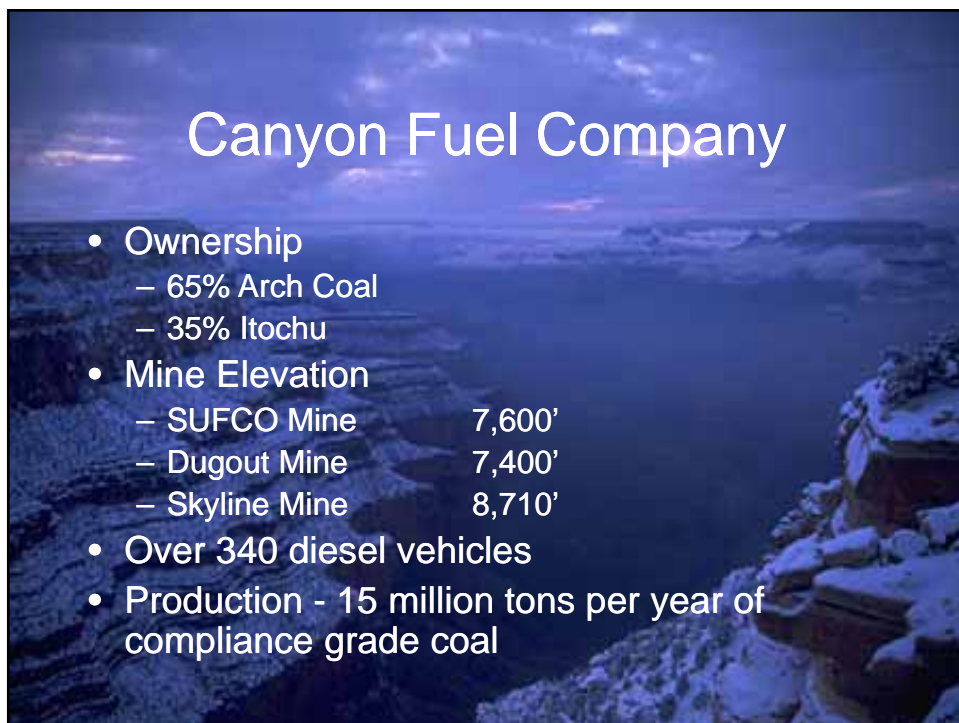


CANYON FUEL COMPANY, LLC
Dugout/Skyline/Sufco Mines

Diesel Emissions Reduction Program

Steve Forbush

MDEC 2002



Canyon Fuel Company

- **Ownership**
 - 65% Arch Coal
 - 35% Itochu
- **Mine Elevation**

– SUFCO Mine	7,600'
– Dugout Mine	7,400'
– Skyline Mine	8,710'
- **Over 340 diesel vehicles**
- **Production - 15 million tons per year of compliance grade coal**

MSHA 1997 Diesel Regulations

- Weekly emission testing
- 30 CFR 75:1914 g

“Undiluted exhaust emissions shall be tested and evaluated weekly by a person who is trained to perform this task.”

1. Repeatable loaded test
2. Check for Carbon Monoxide
3. 2500 ppm Carbon Monoxide???
4. Evaluated and interpreted
5. Tracked for changes in performance
6. Recorded

Canyon Fuels approach

- 1. Find the base line
- 2. Find out where we should be
- 3. Develop a plan to get there
- 4. Develop a plan to handle the weekly test information
- 5. Develop a plan on how and when to react to problem equipment
- 6. Always look for new and better ideas

1. Base line

- November 1997
 - 1597 ppm Carbon Monoxide
 - 947 ppm NOX
- These results were with engines and drive trains set to OEM specifications

2. Where should we be?

- 1. This information is very difficult to obtain
- 2. What is bad and what is good?
- Engine A 350 CO 400 NOX
- Engine B 350 CO 400 NOX
- Engine A certified at 350 CO 400 NOX
- Engine B certified at 62 CO 442 NOX

Where is Canyon Fuel at now?

- Last week
 - 154 ppm CO
 - 402 ppm NOX
- A 90% reduction in CO and 50% reduction in NOX
- These results are with NO ENGINES OR DRIVE TRAINS SET AT OEM SPEC'S.

3. How did we get here?

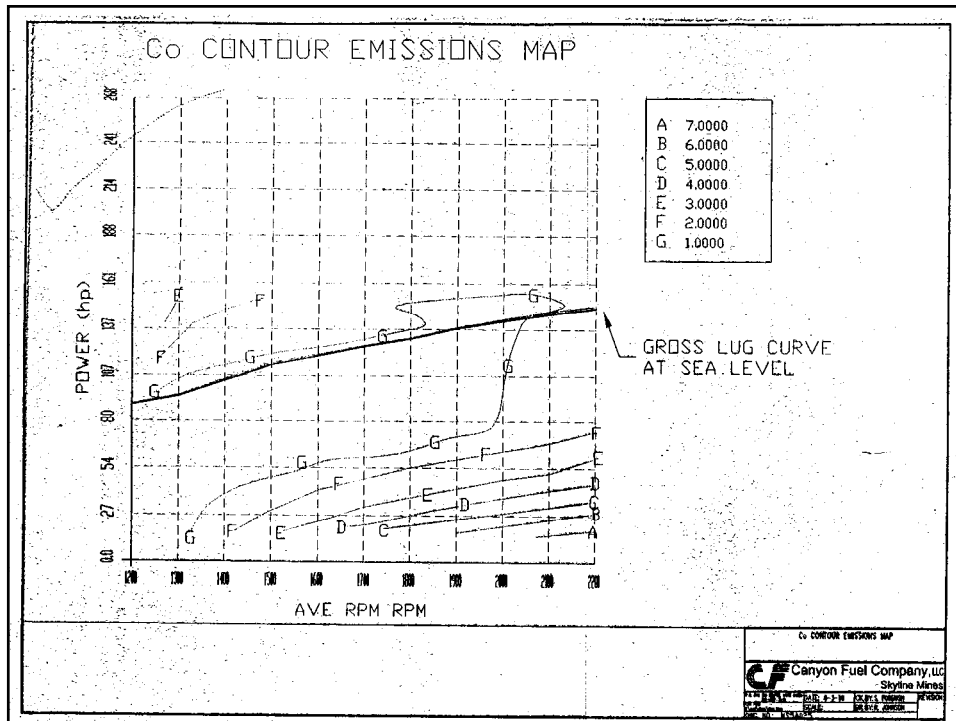
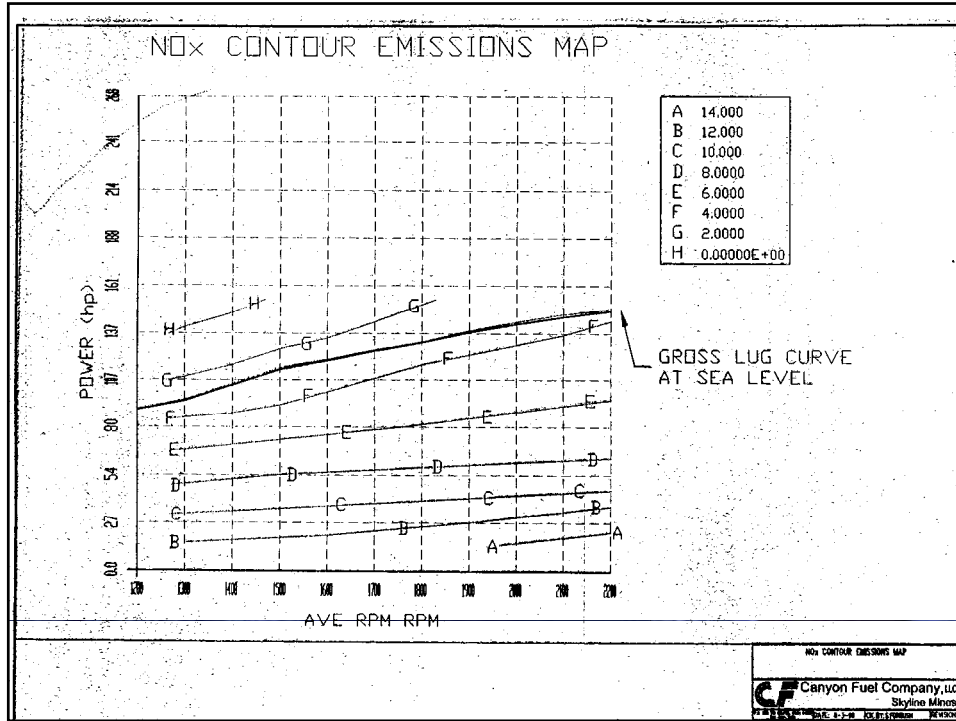
- 100 % buy in from management!!!
- Asking questions about engines, torque converters and transmissions
- Trying to match the drive train components to this altitude and the duty cycle
- Having teams of highly trained technicians at each mine site.

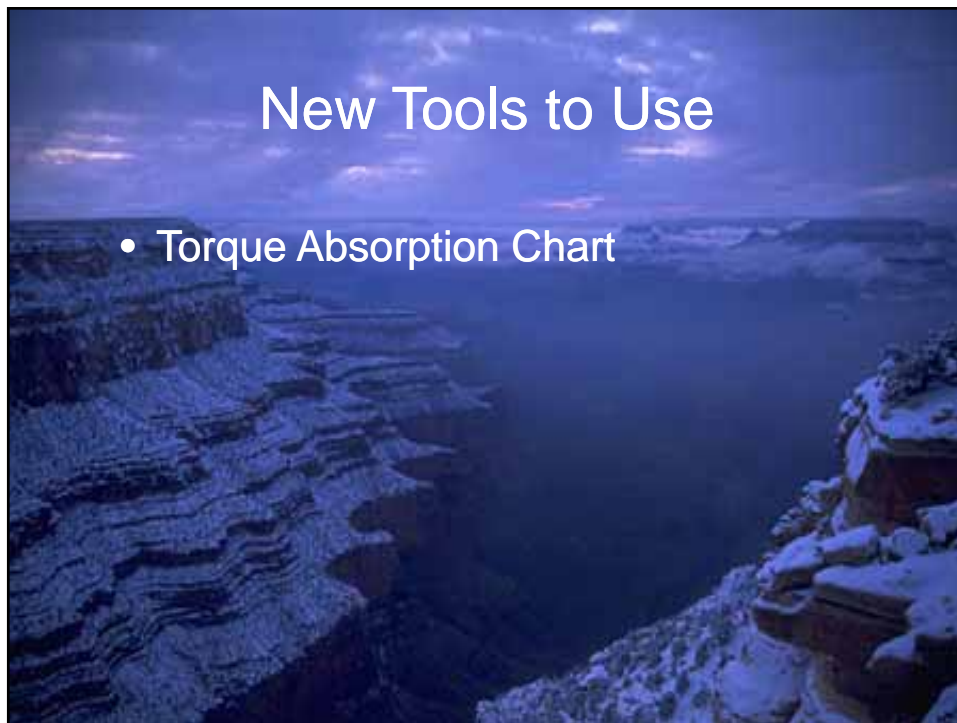
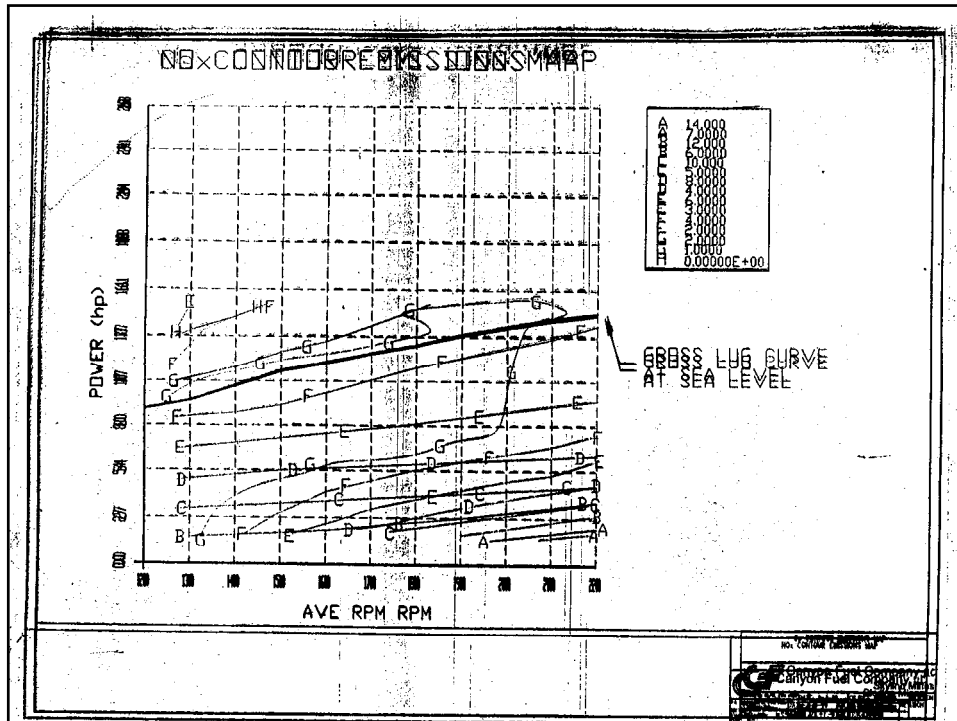
Component Interaction

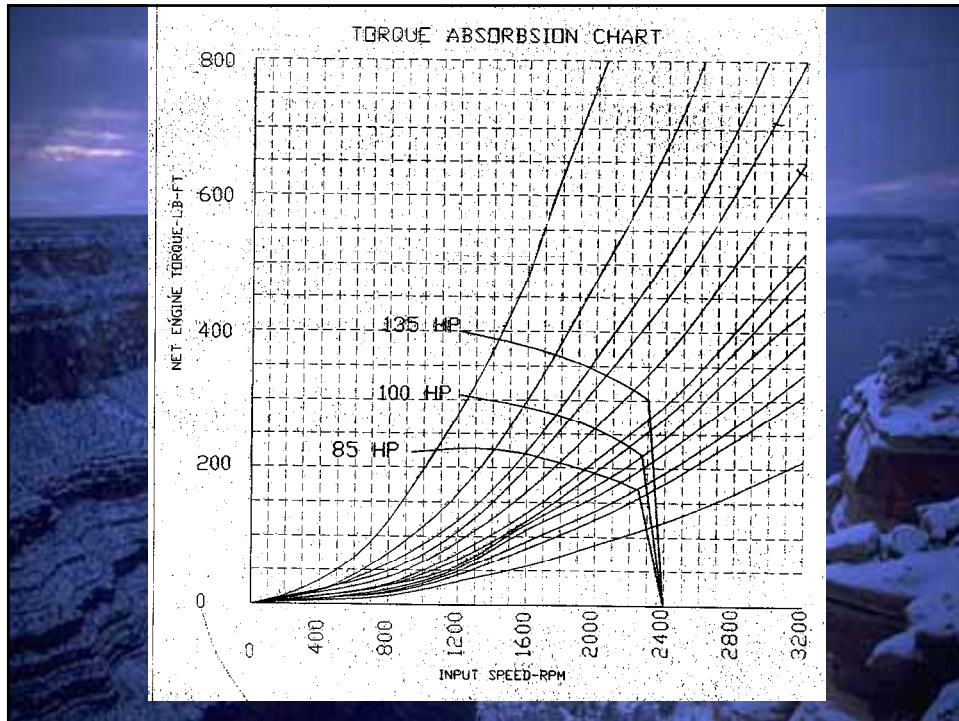
- Engine with Torque Converter
- Torque Converter with Transmission
- Engine, Torque Converter, and Transmission with the Vehicle

New tools to use.

- Emissions Contour Map

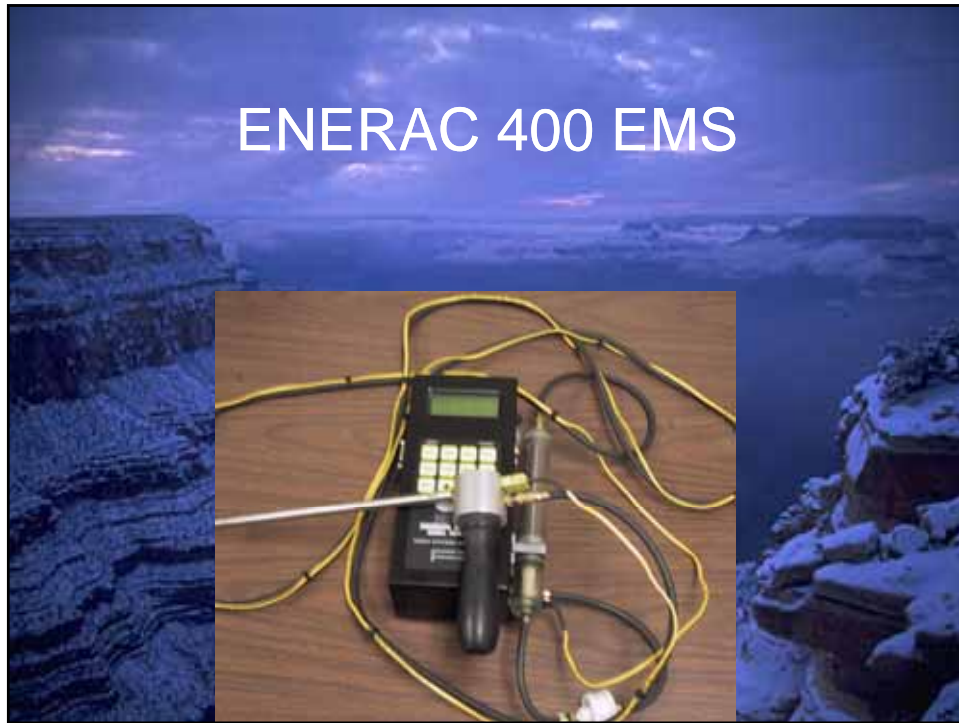






4. Develop a plan on how to handle the weekly test information

- 1. Analyzer
- 2. How to store the data



Weekly Test Information

DIESEL EMISSIONS DATA 03/17/2002

DATA	UNIT	DATE	TIME	Oxygen	Carbon Monoxide	Carbon Dioxide	Nitric Oxide	Nitrogen Dioxide	Oxides of Nitrogen
30	UV005	3/22/2002	8:38:28	10	286	8	322	26	350
31	UV007	3/19/2002	2:14:05	5.5	179	11.4	353	29	382
32	UV008	3/21/2002	2:47:34	11	262	7.3	567	23	590
33	UV010	3/18/2002	5:44:55	4.9	198	11.8	432	44	476
34	UV011	3/18/2002	6:51:02	8.5	219	9.2	404	35	439
35	UV014	3/18/2002	7:18:36	7.7	302	9.7	164	42	206
36	UV015	3/18/2002	5:14:26	7.1	197	10.2	136	31	167
37	UV016	3/18/2002	0:17:30	14.5	275	4.7	174	24	198
38	UV017	3/20/2002	2:46:25	8.4	282	9.2	467	19	486
39	UV021	3/18/2002	6:08:23	6	174	11	227	33	260
40	UT021	3/19/2002	13:10:14	6.9	212	10.3	191	28	219
41	UV022	3/18/2002	23:30:57	13	209	5.8	405	20	425
42	TR010	3/20/2002	5:30:07	9.3	175	8.6	342	13	355
AVERAGE				8.7	228	9.0	321	28	350

5. What to do with this information?

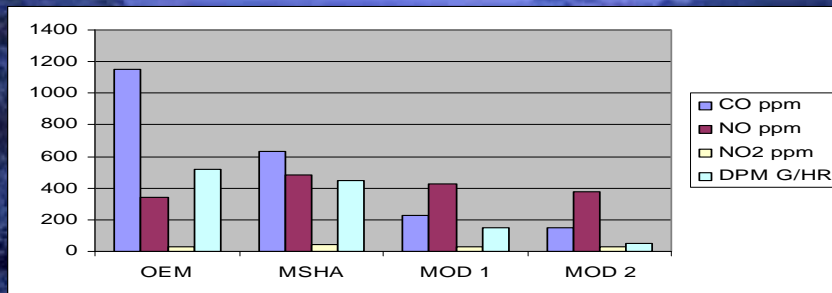
BASELINE

UNIT	BASELINE	% CHANGE	OCT 13 02	OCT 6 02	SEP 29 02	SEP 22 02	SEP 15 02	SEP 8 02	SEP 1 02	AUG 25 02
UV005	275	84	236	231	268	273	327	308		322
UV007	477	62	179	157	231	239	229	304	323	340
UV008	321	82	262	252	305	278	340	302	322	318
UV010	353	58	198	204	215	373	382	393	388	372
UV011	255	115	302	260	242	234	238	243	262	244
UV014	313	97	302	322	316	324	338	327	326	324
UV015	305	65	197	202	213	205	390	386	392	379
UV016	241	112	275	230	244	249	241	239	246	240
UV017	227	120	284	220	234	237	242	227	235	240
UV021	202	87	174	212	216	202	198	195	206	212
UT021	281	76	212	294	288	283	295	274	289	302
UV002	203	102	209	198	204	210	188	194	192	202
TR010	363	49	175	182	188	192	202	188	390	387

What are the Benefits?

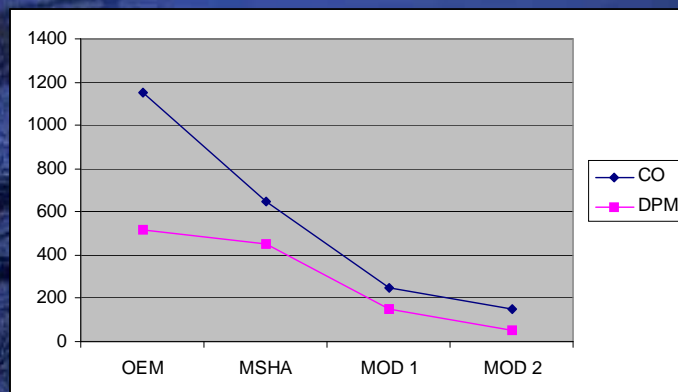
- Better environment for our people
- Fuel consumption cut back by 23% per engine with no loss in power.
- Visibility
- Cooling system problems
- Less down time
- Engine replacements
2001 out of a fleet of 320 units we replaced 9 engines

EMISSIONS CHANGE ON LIKE ENGINES



	OEM	MSHA	MOD 1	MOD 2
CO ppm	1152	632	230	150
NO ppm	340	480	428	380
NO2 ppm	28	45	30	28
DPM G/HR	52	45 ?	14-16	5.3

Carbon Monoxide to DPM



6. What next?

- 1. New engine technology
- 2. New and different fuel technology
- 3. Water scrubber effect
- 4. Ventilation
- 5. After treatment

Questions?