1

00:00:30,000 --> 00:00:32,000

Oh

2

00:00:48,080 --> 00:00:57,480

Who are you ready for the vacuum special the Heinemann abhors a vacuum

3

00:01:00,000 --> 00:01:02,000

Oh

4

00:01:02,000 --> 00:01:04,000

Oh

5

00:01:24,600 --> 00:01:27,680

Jamie I know how much you love riddles and so it's riddle time

6

00:01:28,600 --> 00:01:34,240

Here goes what sucks, but does not suck vacuums. That's right

7

00:01:34,400 --> 00:01:40,160

How did you know that so fast? We just did that opener with model trains and a vacuum cleaner fair enough

8

00:01:40,280 --> 00:01:46,040

Okay, since it's our last season this is a story that has been on our books since literally we started collecting myths

9

00:01:46,040 --> 00:01:51,240

We've just never tackled it because it always seemed like it was too big for us to tackle go on

10

00:01:51,240 --> 00:01:57,080

All right, there's a guy he's tasked with cleaning out one of those tanker cars on a train that holds liquid

11

00:01:57,080 --> 00:02:01,080

And he's using a steam cleaner so he's steam cleaning the whole thing and of course as he's doing that

12

00:02:01,080 --> 00:02:03,440

He's warming it up and it starts to rain

13

00:02:03,520 --> 00:02:10,600

So he caps off the tanker car and walks away the cooling rain causes the steam to contract and as the myth goes

14

00:02:12,280 --> 00:02:21,160

The train car crushes itself from a vacuum exactly that is big those train cars are they're huge. I know

15

00:02:24,000 --> 00:02:26,400

After more than a decade of detonations

16

00:02:28,080 --> 00:02:30,720

Totaling over 900 explosions

17

00:02:34,360 --> 00:02:38,520

For the first time the mythbusters are tackling an implosion

18

00:02:41,480 --> 00:02:45,000

And to do justice to this impressive long-running record

19

00:02:47,200 --> 00:02:54,080

This is gonna be cool they'll be focusing an entire episode on this one super-sized story

20

00:02:57,080 --> 00:03:05,400

I mean look at this it's going to be the biggest productions. We've ever undertaken on this show causing vacuum violence on a massive

21

00:03:06,200 --> 00:03:08,200

unprecedented scale

22

00:03:08,960 --> 00:03:12,040

But first some shop-sized science an

23

00:03:13,280 --> 00:03:14,360

Imploding

24

00:03:14,360 --> 00:03:20,080

Tanker car how could this happen tanker cars are giant 70 feet long 15 feet high

25

00:03:20,280 --> 00:03:27,800

Six steel casing meant to contain things like fuel even in case of a derailment how could something like that spontaneously

26

00:03:29,080 --> 00:03:35,580

Implode and crush itself well if it did in fact happen it had to do with pressure and pressure differential

27

00:03:35,600 --> 00:03:41,800

I'm getting ahead of myself. Let me show you with this metal can if I take this metal can and seal it and

28

00:03:42,160 --> 00:03:48,280

Then hook a vacuum pump up to it and start pumping air out. We understand what will happen. It will crush itself

29

00:03:48,880 --> 00:03:54,280

Whoops, but how could something like that happen without the action of an outside vacuum pump?

30

00:03:54,640 --> 00:03:59,260

Let me show you now. I'm about to perform a critical action in this experiment

31

00:03:59,260 --> 00:04:02,120

And that is to take a little bit of the hot water and pour it into the can

32

00:04:02,400 --> 00:04:06,720

Because in the original myth the tanker car had been steam cleaned inside and out

33

00:04:08,240 --> 00:04:11,520

Now I'm about to initiate an implosion

34

00:04:12,200 --> 00:04:14,200

First thing I do is

35

00:04:14,360 --> 00:04:16,120

cap the can

36

00:04:16,120 --> 00:04:22,080

Now fully capped this vessel was full of steam and air that was heated to its boiling point now

37

00:04:22,160 --> 00:04:28,400

That air is rapidly cooling as it's cooling. They're creating a negative pressure inside the can

38

00:04:28,880 --> 00:04:32,460

Yep, and that's the whole ballgame a difference in pressure

39

00:04:33,280 --> 00:04:36,240

Filling the container with steam pushes out the air

40

00:04:36,880 --> 00:04:41,640

But if the vessel is sealed while it's still hot and then allowed to cool

41

00:04:42,280 --> 00:04:46,120

The steam condenses and the internal pressure drops

42

00:04:47,240 --> 00:04:49,800

Meaning the now much greater external pressure

43

00:04:50,440 --> 00:04:52,440

pushes in on the surface

44

00:04:52,440 --> 00:04:54,440

And that's bad news for the can

45

00:04:55,000 --> 00:04:59,120

Oh, there we go. There we go. Oh, it's actively moving. Look at that

46

00:05:04,560 --> 00:05:08,440

I'm doing this with my mind in case you're wondering this is all telekinesis

47

00:05:12,360 --> 00:05:14,360

I

48

00:05:17,280 --> 00:05:23,840

Mind games aside the scientific principle is clearly sound now. It's just a question of scale

49

00:05:26,920 --> 00:05:30,160

We're gonna ramp things up quite a bit to this 55 gallon drum

50

00:05:30,560 --> 00:05:34,120

which not only have steel walls that are many times thicker but also

51

00:05:35,000 --> 00:05:40,440

Structurally, it's much stronger because it's round and it's got these rips so it'll present much more of a challenge

52

00:05:42,560 --> 00:05:45,560

All right now we just wait for it to boil

53

00:05:47,640 --> 00:05:51,320

For this first test, we're just gonna heat the water up until it's boiling vigorously

54

00:05:51,560 --> 00:05:56,560

Then we'll seal it up turn off the heat let it cool stand back and see what happens

55

00:06:03,800 --> 00:06:10,800

Now that it's sealed a pressure differential can develop and the weight begins for the steam to cool and condense

56

00:06:11,800 --> 00:06:13,800

That kind of makes me nervous

57

00:06:16,200 --> 00:06:23,720

If this sturdy steel barrel collapses confidence will be high that the full-scale tank car can also

crumble

58

00:06:32,560 --> 00:06:37,040

How long did it take the little cans to crush those crushed very very quickly

59

00:06:38,000 --> 00:06:42,240

I'd imagined they're not structurally near as strong. No, I

60

00:06:43,880 --> 00:06:49,240

Think it's gonna be one big catastrophic kind of funk. It's gonna sound like hitting it with a baseball bat

61

00:06:54,360 --> 00:06:59,520

What's really cool about this is we heard a couple of things and bunks at the beginning

62

00:06:59,520 --> 00:07:01,520

Just

63

00:07:04,640 --> 00:07:06,200

Killed me

64

00:07:06,200 --> 00:07:10,120

But right now this thing hasn't made any noise in 15 minutes

65

00:07:10,600 --> 00:07:16,640

But what I know is happening inside there is that it's cooling and that steam is reverting back to water

66

00:07:16,640 --> 00:07:19,960

And it's creating low pressure in there, which is pulling the sides in

67

00:07:22,480 --> 00:07:26,560

They're resisting that because of their structural integrity, but at a certain point I

68

00:07:27,560 --> 00:07:32,280

Expect the outside casing to fail and it should be pretty spectacular

69

00:07:36,560 --> 00:07:38,560

Next time we hold the camera up with magazine

70

00:07:41,120 --> 00:07:43,120

You can feel that

71

00:07:43,120 --> 00:07:45,760

Oh, that was so cool

72

00:07:52,280 --> 00:07:59,360

I could feel that in my chest. Yeah, I'm not sure if that's just my heart leaping out of my throat because of that

73

00:07:59,360 --> 00:08:01,360

That was amazing

74

00:08:04,760 --> 00:08:07,560

It was a nerve-shredding display of power

75

00:08:08,400 --> 00:08:13,040

Wow and an ominous sign of the full-scale potential

76

00:08:13,240 --> 00:08:15,240

But Adam isn't ready to move on

77

00:08:15,960 --> 00:08:23,320

Before they can tackle the super-sized tank car. He wants to know exactly how much negative pressure they're dealing with

78

00:08:24,520 --> 00:08:26,600

This time we're gonna do the same test again

79

00:08:26,600 --> 00:08:32,440

But we're going to have a vacuum pressure gauge attached so that we can actually monitor what that pressure is

80

00:08:33,440 --> 00:08:36,820

We will also be timing how long it takes to cool down and

81

00:08:37,280 --> 00:08:42,280

Monitoring the temperature with an external thermocouple. That's a fancy way of saying thermometer

82

00:08:42,800 --> 00:08:44,800

All right bouncing between

83

00:08:44,800 --> 00:08:50,880

193-195 we'll be logging all of this data as this thing cools down builds this negative pressure

84

00:08:51,240 --> 00:08:54,520

okay timing starts now and

85

00:08:55,520 --> 00:09:00,480

The vacuum gauge is already moving. That's awesome and eventually crushes in the hopes

86

00:09:00,760 --> 00:09:05,360

That we'll be able to apply what we learn here to a full-size thing eventually

87

00:09:05,640 --> 00:09:10,920

Yep, and because the only difference between screwing around and science is writing it down

88

00:09:12,480 --> 00:09:16,000

Adam plots the increase in negative pressure measured in mercury

89

00:09:16,520 --> 00:09:19,080

Right now. It's just a three inches of mercury

90

00:09:19,640 --> 00:09:21,640

against time and temperature

91

00:09:21,760 --> 00:09:23,760

six inches

92

00:09:24,800 --> 00:09:27,880

How much of a vacuum will crush the can is unknown

93

00:09:28,880 --> 00:09:34,080

But quantifying the failure point is the first step to understanding the process I

94

00:09:35,160 --> 00:09:39,400

Like linear data. I'm partial to exponential curves myself

95

00:09:40,440 --> 00:09:46,240

So the more data we gather from this as it cools down that eventually crumples the better equip we are to deal with

96

00:09:46,440 --> 00:09:48,440

Continuities out there in the field

97

00:09:53,240 --> 00:09:56,280

That was just at 16 inches of mercury

98

00:09:58,520 --> 00:10:06,280

These implosions are fascinating. There's a slow intense buildup of the pressure differential and with no warning

99

00:10:07,400 --> 00:10:14,040

But what did we learn well? It took eight minutes for the steam to cool which dropped the pressure to minus 16 inches of mercury

100

00:10:14,720 --> 00:10:19,280

Considering that 30 inches of mercury is a full vacuum. That's significant

101

00:10:19,720 --> 00:10:30,560

Cool sounds and that's just repeating a little water in the drum what happens when we introduce a high-powered steam cleaner into the equation

102

00:10:33,080 --> 00:10:35,080

Coming up on mythbusters

103

00:10:35,840 --> 00:10:36,960

Awesome

104

00:10:36,960 --> 00:10:41,680

Not only is this without a doubt one of my favorite small-scale experiments. We've ever done

105

00:10:42,960 --> 00:10:48,520

The story is on track to be the biggest logistical challenge. They've ever tackled

106

00:10:49,760 --> 00:10:51,760

Holy

107

00:11:04,160 --> 00:11:06,160

Pressure vessels

108

00:11:08,320 --> 00:11:10,320

And pressure differential

109

00:11:11,280 --> 00:11:13,280

Oh

110

00:11:16,480 --> 00:11:21,120

Our familiar themes the mythbusters hold dear to their physics-loving hearts

111

00:11:26,240 --> 00:11:32,160

But in this final season spectacular they're investigating a monumental implosion

112

00:11:33,360 --> 00:11:34,880

This is gonna be cool

113

00:11:34,960 --> 00:11:40,800

Can condensing steam really cause a supersized freight train tank car to crush?

114

00:11:45,280 --> 00:11:49,200

This is great. We are gathering data. We're learning stuff. We're moving forward

115

00:11:52,080 --> 00:11:54,080

16 inches of mercury

116

00:11:54,560 --> 00:12:00,880

But the most important part about this right now is that the original tanker truck had apparently been steam clean prior to the

117

00:12:00,960 --> 00:12:04,960

Implosion incident therefore we're gonna move on to another 55 gallon drum

118

00:12:04,960 --> 00:12:09,760

But this time we're dispensing with the burner and the boiling water and we're gonna steam clean it in advance

119

00:12:10,800 --> 00:12:12,800

Okay, here we go go for it

120

00:12:16,320 --> 00:12:18,320

We're gonna try and get its temperature up

121

00:12:18,960 --> 00:12:20,960

150

122

00:12:21,760 --> 00:12:26,320

And a lot of steam in there before we cap it and see if we can initiate another crushing incident

123

00:12:26,880 --> 00:12:28,880

170

124

00:12:29,120 --> 00:12:31,120

Temperatures climbing fast

125

00:12:31,760 --> 00:12:34,560

Will the high pressure steam cleaner make a difference?

126

00:12:35,920 --> 00:12:36,960

All right

127

00:12:36,960 --> 00:12:38,960

Ceiling at 203

128

00:12:39,040 --> 00:12:46,000

It seems so this crucial component of the mythical mishap has raised the starting temperature by 10 degrees

129

00:12:49,280 --> 00:12:52,880

Consequently it's taking longer for the steam to cool and condense

130

00:12:53,440 --> 00:12:55,440

Just so much bad shed

131

00:12:55,600 --> 00:12:57,600

And the negative pressure to build

132

00:12:59,840 --> 00:13:01,840

16

133

00:13:08,320 --> 00:13:10,320

That gets you every time

134

00:13:11,840 --> 00:13:15,920

That is a heck of a rush that was 17 and a half

135

00:13:17,520 --> 00:13:19,600

There was a greater pressure differential

136

00:13:21,360 --> 00:13:23,360

Oh, yeah

137

00:13:25,600 --> 00:13:27,600

It took twice as long to implode

138

00:13:29,200 --> 00:13:31,200

And

139

00:13:33,040 --> 00:13:35,040

Appeared more violent

140

00:13:37,120 --> 00:13:40,160

It's actually collapsing a lot more than the other one did

141

00:13:40,560 --> 00:13:44,080

I think we put more energy in the system with the higher temperature and the steam

142

00:13:45,280 --> 00:13:52,320

Yep, more heat means the steam has more kinetic energy and faster water molecules create more pressure

143

00:13:53,120 --> 00:13:56,720

Yeah, look at that. Look at that. That is completely crushed

144

00:13:57,200 --> 00:14:02,640

So when the steam condensed in the capped container the eventual pressure differential was greater

145

00:14:04,960 --> 00:14:07,120

And the drum took even more of a beating

146

00:14:08,960 --> 00:14:13,680

But behind the scenes problems are afoot. Okay, keep very quiet

147

00:14:13,680 --> 00:14:17,760

We don't often show you this part of the show, but this is where the magic happens

148

00:14:17,840 --> 00:14:24,720

This is our production office and those are our producers that find the impossible to find stuff that Jamie and I need to use in episodes

149

00:14:24,800 --> 00:14:28,400

This is the team that has found us things like a 747

150

00:14:30,320 --> 00:14:32,320

RPGs

151

00:14:34,080 --> 00:14:38,000

We're calling the faa to get us permission to drop a car from a helicopter

152

00:14:38,880 --> 00:14:43,280

But right now this might very well be mission implosion

153

00:14:43,840 --> 00:14:46,400

Impossible, but we'll give them a couple more days

154

00:14:50,240 --> 00:14:54,640

So what is it we need exactly well, obviously a tank car one that's been decommissioned

155

00:14:54,720 --> 00:14:59,040

And yet is still structurally sound that's hard enough, but we also need a place to

156

00:14:59,760 --> 00:15:02,960

implode it that implies tracks to run it on and a location

157

00:15:03,520 --> 00:15:10,160

Remote enough that we can safely control that implosion involving millions of pounds of force and thousands of pounds of steel

158

00:15:10,400 --> 00:15:16,720

Without hurting any people or infrastructure and the two of those together are the reason we have never tackled this myth before

159

00:15:18,240 --> 00:15:22,320

With the production office facing long odds and a short deadline

160

00:15:25,200 --> 00:15:27,840

Jamie and adam get busy drumming up more data

161

00:15:29,600 --> 00:15:32,400

So what else can these barrels tell us that'll help us out in the field?

162

00:15:32,960 --> 00:15:36,400

Well shape and geometry are critical when it comes to pressure vessels

163

00:15:36,800 --> 00:15:42,320

And so we're going to build a more accurate scale version of our tank car cylinder and see what difference that makes

164

00:15:43,600 --> 00:15:49,280

Will the elongated cylinder of an accurately scaled tank car crush more or less easily?

165

00:15:50,080 --> 00:15:52,560

To find out jayney has been busy welding

166

00:15:52,960 --> 00:15:56,000

Well adam whips up some wooden wheels

167

00:15:58,160 --> 00:16:02,000

Almost there and gets back to his special effects roots

168

00:16:04,080 --> 00:16:08,320

There we go, I'm much happier when our experiments look at the part

169

00:16:10,560 --> 00:16:12,560

Ah awesome

170

00:16:15,760 --> 00:16:18,800

As before they simulate the steam cleaning process

171

00:16:19,520 --> 00:16:21,520

It's great for our skin

172

00:16:22,800 --> 00:16:24,800

Until the temperature maxes out

173

00:16:25,280 --> 00:16:31,280

200 then they seal it up. All right cap it up and resume their nerve-wracking way

174

00:16:32,320 --> 00:16:34,320

Timer's going

175

00:16:34,480 --> 00:16:36,480

Oh, hey

176

00:16:38,960 --> 00:16:40,960

Oh, you can hear it boiling. Oh

177

00:16:45,120 --> 00:16:48,320

You can totally hear it boiling that's awesome

178

00:16:49,280 --> 00:16:51,280

I

179

00:16:53,040 --> 00:16:59,040

Can't help but think that this would be weaker because of the lack of any bulkheads down the length of it

180

00:17:05,200 --> 00:17:08,560

Okay seven minutes in we're 11 inches of mercury

181

00:17:11,280 --> 00:17:16,160

Oh awesome. Oh that was fantastic

182

00:17:19,760 --> 00:17:21,760

Oh

183

00:17:24,720 --> 00:17:26,720

Oh, that was fabulous

184

00:17:29,360 --> 00:17:31,360

That is awesome

185

00:17:34,960 --> 00:17:39,200

You were right it was weaker it failed at a lower negative pressure than the previous one

186

00:17:40,640 --> 00:17:42,640

Another spectacular implosion

187

00:17:43,440 --> 00:17:48,880

The accurately scaled form failed faster and under less pressure

188

00:17:51,360 --> 00:17:57,760

That's just awesome data that suggests this supersized myth is right on track

189

00:18:00,240 --> 00:18:02,240

Later on mythbusters

190

00:18:04,240 --> 00:18:06,240

The tension tightens

191

00:18:06,640 --> 00:18:12,480

Holy s*** will the tank car or hosts crack first?

192

00:18:23,120 --> 00:18:28,480

For over a decade the mythbusters have traveled to incredible and expansive locations

193

00:18:29,680 --> 00:18:33,600

To carry out their investigations. Good to see you. Welcome to the white house

194

00:18:33,920 --> 00:18:40,000

They've managed supersized logistical operations of massive proportions

195

00:18:41,120 --> 00:18:48,320

It is in gentlemen 70,000 feet, but in this final season farewell. They're tackling that toughest of them all

196

00:18:50,640 --> 00:18:56,400

Welcome to argon the end of the line for the tall tail of the imploding tank car

197

00:18:57,200 --> 00:19:04,000

After months of prep sweat and fears the team has pulled it off

198

00:19:04,880 --> 00:19:11,280

It's time to stock and roll if it is indeed possible for a tank car to crush itself

199

00:19:12,640 --> 00:19:17,120

But then the testing of it is going to be one of the biggest productions we've ever undertaken on this show

200

00:19:20,000 --> 00:19:23,840

That is the biggest steam cleaner you have ever seen

201

00:19:23,920 --> 00:19:28,240

We need not only the tank car and some train tracks because that's how they get around

202

00:19:28,240 --> 00:19:32,400

But we also need a facility where we can shut down access to those tracks for safety

203

00:19:36,400 --> 00:19:38,400

Let's get to crushing

204

00:19:38,960 --> 00:19:47,360

There's no doubt about the size of the undertaking and the first piece of this giant experimental pressure puzzle is bringing the heat

205

00:19:48,320 --> 00:19:52,240

This boiler is the heart of our experiment. This is a two million

206

00:19:52,960 --> 00:19:55,760

BTU fire tube style boiler now

207

00:19:55,760 --> 00:20:00,720

What's in here is a series of tubes surrounded with water and obviously is going to heat up that water

208

00:20:00,720 --> 00:20:05,840

And it's going to create a head of steam that comes up about here and that steam is going to be up to around

209

00:20:06,960 --> 00:20:08,960

360 degrees Fahrenheit

210

00:20:09,040 --> 00:20:11,040

That's what's going to heat up our tank car

211

00:20:12,320 --> 00:20:15,200

And here's why the steamer is packing so much punch

212

00:20:15,840 --> 00:20:17,840

I'm gonna go get some tank cars

213

00:20:17,920 --> 00:20:22,480

It was almost impossible to locate but in a coupling made in geek heaven

214

00:20:24,320 --> 00:20:30,640

Adam hooks up with the super-sized star of the show. I totally get the whole thing about model trains

215

00:20:32,960 --> 00:20:38,560

How cool is that I had a whole bunch when I was in high school. Hello ladies

216

00:20:39,040 --> 00:20:41,040

This

217

00:20:43,840 --> 00:20:47,840

This is our experimental baby our tank car isn't it beautiful

218

00:20:49,040 --> 00:20:56,160

67 feet long 10 feet diameter it holds almost 30 000 gallons of liquid unless you think that the shell is thin

219

00:20:56,400 --> 00:20:58,400

It's actually almost half an inch thick

220

00:20:59,040 --> 00:21:02,160

It's the biggest single prop ever used on myth busters

221

00:21:02,880 --> 00:21:07,920

Weighing in at 67 000 pounds made from cold rolled steel

222

00:21:08,640 --> 00:21:11,840

It seems impossible that it could crush like a tin can

223

00:21:13,280 --> 00:21:15,280

To check its interior integrity

224

00:21:15,840 --> 00:21:17,840

Adam pulls the short straw

225

00:21:19,120 --> 00:21:21,520

This is not for people who don't like confined spaces

226

00:21:22,720 --> 00:21:25,760

You might think that crawling into one of these tank cars is a simple matter

227

00:21:25,760 --> 00:21:28,960

But they transport all manner of different fluids and liquids

228

00:21:28,960 --> 00:21:33,600

Which means there can be all manner of different gases in that tank car that could asphyxiate you

229

00:21:35,680 --> 00:21:37,680

You have no idea how hot it is in here

230

00:21:38,640 --> 00:21:43,200

There's an entire set of safety procedures. We had to review before climbing down in there

231

00:21:43,360 --> 00:21:47,440

I'm wearing a safety harness lest I become unconscious so I can be pulled back out

232

00:21:48,320 --> 00:21:50,320

The walls are 101 degrees

233

00:21:51,280 --> 00:21:54,640

A quick recce and adam's nervous but satisfied

234

00:21:55,280 --> 00:21:56,800

It's just a hell

235

00:21:56,800 --> 00:21:58,800

There's no internal gusting at all

236

00:21:59,280 --> 00:22:01,280

And I'm talking quietly

237

00:22:01,680 --> 00:22:05,360

Because this thing is a freaking echo chamber if someone dropped a wrench up there

238

00:22:06,000 --> 00:22:08,000

I feel like my eardrums would bleed

239

00:22:09,520 --> 00:22:15,040

It's loud but sound too sound

240

00:22:15,280 --> 00:22:16,320

Oh man

241

00:22:16,320 --> 00:22:23,120

To ensure they can form a pressure vessel the team bypasses the safety features by sealing the release valves

242

00:22:24,000 --> 00:22:25,200

What's next?

243

00:22:25,200 --> 00:22:29,840

Remember this myth is about heating the tank car up and then it happens to rain and cools it down

244

00:22:30,240 --> 00:22:34,400

So this thing right here is called a monitor and it's a spray nozzle

245

00:22:34,640 --> 00:22:38,160

We're going to try to adjust the angle and the pressure in such a way

246

00:22:38,320 --> 00:22:43,360

More this way that we can get as much of an even coverage of the tank car as possible

247

00:22:44,560 --> 00:22:46,640

I'm happy with that. That's a perfect rainstorm

248

00:22:48,960 --> 00:22:54,000

This is a giant production and one of the key things we want to monitor is the temperature of our tank

249

00:22:54,240 --> 00:22:59,040

Behind each one of these windows, we're going to have a thermometer that thermometer will go to a wire

250

00:22:59,040 --> 00:23:03,200

Which will go out there to the tank car where it will be attached to a thermo company

251

00:23:04,000 --> 00:23:06,000

Let's hook it up

252

00:23:07,200 --> 00:23:08,320

Cool

253

00:23:08,320 --> 00:23:13,120

In addition to temperature the second crucial parameter is the internal pressure

254

00:23:13,600 --> 00:23:15,600

This is officially the biggest thing I've ever drilled into

255

00:23:16,480 --> 00:23:19,840

Adam plums the steel wall and inserts a vacuum gauge

256

00:23:21,040 --> 00:23:24,160

We just turned this tank car into an experimental vessel

257

00:23:25,040 --> 00:23:27,540

And it's primed for the first step of the test

258

00:23:28,720 --> 00:23:31,200

The colossal steam cleaner is fired up

259

00:23:31,200 --> 00:23:34,400

And Adam is struggling to take it all in

260

00:23:35,840 --> 00:23:37,840

I'm having one of those moments right now

261

00:23:38,240 --> 00:23:39,200

rabid

262

00:23:39,200 --> 00:23:43,760

excitement about what is about to take place at the same time it's combined with

263

00:23:44,400 --> 00:23:48,320

A complete disbelief about what we've got set up here. I mean look at this

264

00:23:48,400 --> 00:23:51,680

We've locked down two and a half miles of train track a mile of road

265

00:23:51,840 --> 00:23:54,640

We've got about 35 guys and one two three four five

266

00:23:55,200 --> 00:24:01,120

A dozen trucks to support the implosion of that giant 70 foot long tanker car

267

00:24:02,160 --> 00:24:04,160

This is gonna be cool

268

00:24:09,440 --> 00:24:17,120

So this myth starts with a lonely train car that's just delivered its payload and it's sitting here on the tracks waiting to be cleaned

269

00:24:18,160 --> 00:24:22,880

The cleaning comes in the form of steam go ahead and open up the valve and start putting steam in the tank

270

00:24:23,040 --> 00:24:25,040

The valve opening

271

00:24:26,480 --> 00:24:32,880

Piping hot at over 300 degrees its goal is to remove every last trace of residue from the previous cargo

272

00:24:38,960 --> 00:24:41,460

It's happening. Yeah, it's already rising

273

00:24:44,400 --> 00:24:51,120

Unfortunately once the service guys had done their job they closed every hatch and valve on the tank car

274

00:24:52,000 --> 00:24:54,000

Something they should never have done

275

00:24:54,000 --> 00:24:57,120

It's gonna take a while. Yeah a lot of mass to heat up. Yeah

276

00:24:58,240 --> 00:25:04,960

Even more unfortunately it then begins to rain and the completely sealed tank car full of highly expanded steam begins cooling

277

00:25:05,440 --> 00:25:10,800

Rapidly precipitously dropping the interior pressure. And then what happens next is the whole tank car

278

00:25:11,360 --> 00:25:13,360

Collapses in on itself

279

00:25:15,040 --> 00:25:17,920

That was that gonna happen when we replicate all of those story points

280

00:25:18,080 --> 00:25:22,640

We don't know that's why we're testing it, but we will be monitoring everything from the safety of our bunker here

281

00:25:27,440 --> 00:25:32,000

While we've been heating our tank car now for about three hours and its temperature has been steadily rising

282

00:25:32,000 --> 00:25:37,680

And it's very close to our small scale temperature of over 200 degrees. That's great any minute now

283

00:25:37,680 --> 00:25:43,040

We're gonna call it. I'm gonna suit up. I'll cap it get the heck out of its way and hopefully we'll watch it crush itself

284

00:25:43,680 --> 00:25:45,680

Here we go

285

00:25:46,640 --> 00:25:49,120

This is it I gotta climb on top of that thing

286

00:25:50,400 --> 00:25:52,400

Almost 210 degrees

287

00:25:52,960 --> 00:25:55,440

Shut the top man way then I set the bottom valve

288

00:25:56,800 --> 00:26:01,040

Adam enters the exclusion zone alone and climbs the boiling hot steel

289

00:26:06,400 --> 00:26:11,920

He has to be fast and careful while he creates a 60 ton pressure vessel

290

00:26:12,560 --> 00:26:15,600

Okay, we're sealed up here on climbing down

291

00:26:18,880 --> 00:26:20,880

You're closing the valve now

292

00:26:21,360 --> 00:26:25,200

Valve is closed. I am de-assing the area mission accomplished

293

00:26:25,520 --> 00:26:29,840

It's capped and the countdown to catastrophe begins. I went smothering

294

00:26:31,040 --> 00:26:33,040

Once I get back in the bunker

295

00:26:33,040 --> 00:26:35,040

It's gonna be time to make it rain

296

00:26:35,120 --> 00:26:40,400

Yep, when things cool down everything is right on track for the mythical implosion

297

00:26:40,960 --> 00:26:44,480

All right fire department. Let's make it rain copy making it rain

298

00:26:50,160 --> 00:26:53,680

Oh perfect coming up

299

00:26:54,720 --> 00:27:04,000

Oh, did you hear that this tank car tall tail terminates with a titanic test of the team's ingenuity and nerves

300

00:27:05,360 --> 00:27:07,360

Man that thing's so friggin big

301

00:27:11,280 --> 00:27:18,000

It's been a monumental effort

302

00:27:19,120 --> 00:27:21,120

All right fire department. Let's make it rain

303

00:27:22,640 --> 00:27:27,920

But the team finally has all the many parts of this mythical freight train mishap in place

304

00:27:29,600 --> 00:27:32,240

Q the physics five inches of mercury

305

00:27:34,880 --> 00:27:36,880

Six

306

00:27:36,880 --> 00:27:39,920

Nice climbing steadily. That's what we wanted to see

307

00:27:40,480 --> 00:27:46,960

The rain cools the steel the steam inside begins to condense and the negative pressure rises

308

00:27:49,760 --> 00:27:52,160

That is climbing a lot faster than our small scale

309

00:27:52,720 --> 00:27:58,000

The small scale car crushed at 11 inches the single oil drum at 17

310

00:27:58,320 --> 00:28:06,080

But a full-scale tank car implosion has never been recorded the mythbusters are once again in unknown

311

00:28:06,400 --> 00:28:08,880

Scientific territory 12 and a half. Oh

312

00:28:11,280 --> 00:28:15,600

Oh, I'm psyched the pressure differential 13

313

00:28:19,680 --> 00:28:26,240

Means there's already more than 1.5 million pounds of pressure pushing on the exterior surface

314

00:28:27,680 --> 00:28:33,200

Man that makes me nervous that thing's so friggin big. I know and it keeps on rising

315

00:28:34,160 --> 00:28:36,160

17 and a half

316

00:28:38,560 --> 00:28:45,040

We've now exceeded our small scale pressures. It's ramping up just like the suspense. Come on, baby

317

00:28:45,600 --> 00:28:47,760

19 and a half and the tension

318

00:28:48,720 --> 00:28:50,640

21

319

00:28:50,640 --> 00:28:52,640

Wow

320

00:28:54,800 --> 00:28:59,520

Man it's nerve-wracking it is and I know that the like the moment I blink it's gonna happen

321

00:29:00,880 --> 00:29:02,880

23

322

00:29:02,960 --> 00:29:04,960

Damn

323

00:29:10,400 --> 00:29:12,400

25 and a half

324

00:29:13,200 --> 00:29:15,200

Holy

325

00:29:16,480 --> 00:29:18,800

15 minutes after sealing in the steam

326

00:29:19,600 --> 00:29:24,000

The negative internal pressure is almost as low as it can possibly go

327

00:29:25,520 --> 00:29:27,520

26 and a quarter

328

00:29:27,760 --> 00:29:35,920

Degraze is almost a full vacuum that that occurs at just under 30 inches of mercury and still there's no sign of an implosion

329

00:29:37,520 --> 00:29:39,520

Why they make these things tough, don't they?

330

00:29:40,640 --> 00:29:42,640

As the minutes tick by

331

00:29:42,640 --> 00:29:47,220

This is killing me right 18 and a half minutes the negative pressure plateaus

332

00:29:47,920 --> 00:29:49,920

26 and 5 8

333

00:29:52,160 --> 00:29:56,400

And for the first time the guys think the tank car might not collapse

334

00:29:56,960 --> 00:29:59,360

Remember folks science can be boring

335

00:30:01,600 --> 00:30:06,080

Look everything is working here exactly as we plan our methodology is dead on the money

336

00:30:08,320 --> 00:30:10,320

It's not working

337

00:30:10,880 --> 00:30:14,640

We've got a superheated tanker that was steam cleaned that we've now been

338

00:30:14,960 --> 00:30:22,080

Reigning on and the pressure is built far beyond what I would have considered to be a fatal catastrophic pressure to this tanker car

339

00:30:22,320 --> 00:30:25,280

And yet it's holding on at 27 inches of mercury

340

00:30:25,760 --> 00:30:28,480

This is astonishing. This is a very durable

341

00:30:29,280 --> 00:30:31,280

durable item

342

00:30:32,640 --> 00:30:34,640

It hasn't budged

343

00:30:35,360 --> 00:30:38,560

Okay, folks, we're gonna wait for it to be an even hour

344

00:30:39,760 --> 00:30:43,520

And if we haven't seen any movement on the needle by then we'll call it

345

00:30:44,080 --> 00:30:49,520

The pressure leveled off at 27 and hasn't budged and neither has the tank car

346

00:30:50,000 --> 00:30:54,480

So when they hit the hour here we go, they reluctantly concede defeat

347

00:30:55,280 --> 00:30:57,440

Hold the plug and let the air back in

348

00:31:01,120 --> 00:31:06,400

Hey nice work on the rig everything we did work beautifully, but you wouldn't break

349

00:31:07,200 --> 00:31:09,200

It's not our fault

350

00:31:10,160 --> 00:31:14,720

Technically what we did to this car to try and make it collapse with a vacuum was flawless

351

00:31:18,720 --> 00:31:23,120

Oh, it's like the train car is peeing on me out of spite

352

00:31:25,440 --> 00:31:29,280

Got the tank really hot. We'd sealed it up really well

353

00:31:30,080 --> 00:31:36,400

We pulled darn near a perfect vacuum on it and yet nothing we did to it made it collapse

354

00:31:36,640 --> 00:31:37,520

so

355

00:31:37,520 --> 00:31:40,720

It turns out these cars are actually built pretty darn good, but

356

00:31:41,680 --> 00:31:43,040

You know what?

357

00:31:43,040 --> 00:31:49,120

We're not done yet. We've gotten back on the phone. We've ordered another tank car as if the first one wasn't difficult enough

358

00:31:49,200 --> 00:31:53,920

Now why are we going to such extreme lengths here? It's because despite evidence to the contrary

359

00:31:54,080 --> 00:32:00,560

We don't think this myth is busted yet. Look the car that mythically imploded might have been damaged in some way that we couldn't see

360

00:32:00,560 --> 00:32:05,920

It might have been corroded on the inside some way in which it was made more susceptible to crumpling

361

00:32:06,160 --> 00:32:11,600

So we found another one and although it'll take us all night for you. It'll be a matter of seconds

362

00:32:16,240 --> 00:32:18,240

Yeah, let's crush some stuff

363

00:32:18,240 --> 00:32:21,680

With their more corroded car in place

364

00:32:22,000 --> 00:32:27,520

They're removing the steam and rain from the equation and taking a shortcut to pulling the pressure

365

00:32:28,560 --> 00:32:32,240

This time around though, we're going to use this big-ass industrial vacuum

366

00:32:34,400 --> 00:32:37,760

It'll pull exactly the same vacuum that we got with the steam

367

00:32:38,960 --> 00:32:43,120

Is there anything duct tape can't do but it's going to do it in a fraction of the time

368

00:32:43,200 --> 00:32:49,040

Yep, the goal is to match the realistic negative pressure achieved using condensed steam

369

00:32:49,680 --> 00:32:54,640

With this giant vacuum cleaner. All right, so are you ready? I'm ready. All right

370

00:32:54,640 --> 00:33:02,080

So we have our second more decrepit tanker car sitting over there on the track and our giant vacuum hub is just starting up now

371

00:33:04,880 --> 00:33:06,880

That is a beautiful piece of equipment

372

00:33:08,000 --> 00:33:09,440

It's going to pull a vacuum

373

00:33:09,440 --> 00:33:14,160

It's going to pull the same exact vacuum we pulled with the boilers and the pressure and the cooling etc

374

00:33:14,720 --> 00:33:19,280

I do not want to take my eyes off of it. Just want to watch it do its thing

375

00:33:20,560 --> 00:33:22,560

Except it should do it in a fraction of the time

376

00:33:23,520 --> 00:33:25,840

I want it. Oh, shit. Here's hoping

377

00:33:27,920 --> 00:33:29,920

That's what I want

378

00:33:30,720 --> 00:33:32,720

The giant vacuum pump is fast

379

00:33:33,680 --> 00:33:41,520

It's rapidly removing air and after just a few minutes it's already approaching the maximum negative pressure it can pull

380

00:33:42,320 --> 00:33:44,320

We got a negative 25

381

00:33:45,120 --> 00:33:48,960

Negative 25 will the more corroded drums succumb?

382

00:33:52,960 --> 00:34:00,080

Holding at 27 holding at 27 inches of mercury that's exactly where we were yesterday. Yeah

383

00:34:03,040 --> 00:34:15,440

To celebrate their final season, this is the myth busters number crunching countdown

384

00:34:18,080 --> 00:34:23,600

When it comes to supersize stories, it's the stats that reflect the scale

385

00:34:24,800 --> 00:34:31,520

Here's a hit list of the biggest and best the rocket sled hits 750 miles per hour

386

00:34:32,720 --> 00:34:34,720

Holy crap

387

00:34:34,880 --> 00:34:38,480

This was shot at 70 000 frames a second

388

00:34:39,120 --> 00:34:41,920

A car was dropped from 4 000 feet

389

00:34:42,560 --> 00:34:46,320

The biggest boom was 5 000 pounds of anfoam

390

00:34:48,320 --> 00:34:55,920

And adam joined the 13 mile high club when he flew to the edge of space. This is not a bad way to spend your day

391

00:35:03,520 --> 00:35:11,520

It's been a long and winding train track, but you wouldn't break

392

00:35:12,880 --> 00:35:21,440

And the team is about to find out once and for all if a steam clean and accident can cause a giant steel tank car to crush

393

00:35:22,880 --> 00:35:25,920

They've reached the same negative pressure they managed with steam

394

00:35:26,800 --> 00:35:29,200

Holding at 27 inches of mercury

395

00:35:30,160 --> 00:35:34,880

And several million pounds of force are pushing against the half inch thick steel

396

00:35:35,520 --> 00:35:37,120

squeezing

397

00:35:37,120 --> 00:35:39,120

squashing and pressing

398

00:35:42,160 --> 00:35:46,880

But the minutes tick by and it remains resolutely intact

399

00:35:49,120 --> 00:35:51,120

Still holding at 27

400

00:35:51,920 --> 00:35:53,920

Unlike their small scale

401

00:35:54,400 --> 00:35:56,400

It may not be imploding

402

00:35:56,880 --> 00:35:59,120

But it is an astonishing result

403

00:36:00,000 --> 00:36:04,160

You know as frustrating as this is to not see the train car collapse

404

00:36:04,240 --> 00:36:08,160

this is looking like it's a very valid myth because

405

00:36:09,040 --> 00:36:14,480

Everybody that we talked to swore up and down that oh no problem. This thing's gonna collapse

406

00:36:16,960 --> 00:36:20,560

That's it. That's an hour. Let's cut it turn it off

407

00:36:21,120 --> 00:36:26,960

So it just goes to show you gotta test things

408

00:36:30,400 --> 00:36:32,800

That's the sound of disappointment ladies and gentlemen

409

00:36:36,960 --> 00:36:45,360

These tank cars are actually pretty tough little bastards, but as always we have one more trick up our sleeve

410

00:36:45,600 --> 00:36:51,040

Yep, this has been such an ordeal. There is no way we are just gonna leave it here

411

00:36:51,440 --> 00:36:56,800

We are now going to arrange for our tanker car to encounter a bit of a shall we say

412

00:36:57,360 --> 00:36:58,480

accident

413

00:36:58,480 --> 00:37:03,360

All we need is a crane to drop something big and heavy on our tanker car

414

00:37:03,440 --> 00:37:07,920

And luckily it turns out that the sheriff who's been helping us out has access to a crane

415

00:37:08,640 --> 00:37:10,640

That is how we

416

00:37:10,640 --> 00:37:16,480

Are going to use that to lift this about 30 feet above that and then we're going to drop it

417

00:37:17,520 --> 00:37:20,320

Hopefully it'll leave a nice big dent in our tank car

418

00:37:20,880 --> 00:37:25,680

And then when we pull a vacuum on it that dent will cause the whole thing to buckle up

419

00:37:26,240 --> 00:37:29,360

Kind of like pulling a single card out of a house of cards

420

00:37:30,080 --> 00:37:32,080

At least that's what we hope

421

00:37:32,080 --> 00:37:38,480

Yep, it's an extremely unlikely series of events, but it is possible. That looks good to me, jamie

422

00:37:38,960 --> 00:37:46,560

After their simulated collision, they'll pull a final vacuum to recreate the steam cleaning and see if that causes a crumple

423

00:37:48,240 --> 00:37:52,560

This is intense dropping 3200 pounds on a tank car

424

00:37:53,600 --> 00:37:57,280

Something we didn't expect to be doing in this episode three two one

425

00:38:03,280 --> 00:38:05,280

Bullseye

426

00:38:09,040 --> 00:38:11,040

That's ideal

427

00:38:13,840 --> 00:38:21,280

With their completely accidental damage done, it's deja vu all over again. All right Dean go ahead and start the vacuum

428

00:38:22,560 --> 00:38:24,560

The vacuum pump fires up

429

00:38:24,560 --> 00:38:27,040

Starts sucking and the pressure plunges

430

00:38:27,600 --> 00:38:31,200

Will the kink in the steel compromise the structural integrity?

431

00:38:33,760 --> 00:38:35,920

10 minutes 21 inches of mercury

432

00:38:38,480 --> 00:38:55,440

That is a hell of a vacuum pump right there. Yeah, it's also a hell of a dent. It's a perfect dent we made. Yeah

433

00:38:57,280 --> 00:38:59,280

23 23 inches

434

00:38:59,280 --> 00:39:01,280

Come on

435

00:39:07,520 --> 00:39:09,520

Come on you melon farmer

436

00:39:21,680 --> 00:39:27,360

Finally oh 23 inches of mercury holy cow

437

00:39:30,000 --> 00:39:39,760

This is all about the geometry just like with a chicken's egg

438

00:39:40,160 --> 00:39:43,760

It's really quite strong and you can't break them in your hand if you squeeze them

439

00:39:44,160 --> 00:39:47,600

But all it takes is one little crack on the side of the frying pan

440

00:39:49,040 --> 00:39:54,000

You've got a dent just like what we put in this tank car and the whole thing unravels

441

00:40:00,240 --> 00:40:06,800

Man look at that that is beautiful

442

00:40:10,800 --> 00:40:16,880

I've never seen anything quite like that something that large and sturdy being deformed like that

443

00:40:23,760 --> 00:40:25,760

It's kind of hard to take it in

444

00:40:26,000 --> 00:40:31,920

Really is it doesn't seem right somehow. I'm getting a kind of a scale vertigo. Yeah. Yeah

445

00:40:44,240 --> 00:40:51,600

Oh, we had pulled a nearly full vacuum on two 67 foot long tank cars and achieved

446

00:40:52,240 --> 00:40:53,520

bupkus

447

00:40:53,520 --> 00:40:54,640

nothing

448

00:40:54,640 --> 00:40:56,640

In desperation we dropped a

449

00:40:57,280 --> 00:41:04,560

3200 pound concrete block on it and left a huge dent not a recommended technique for proper care and feeding of tank car

450

00:41:04,720 --> 00:41:11,200

And yet it seemed to do the trick because at 23 inches of mercury that tank car folded

451

00:41:12,480 --> 00:41:15,040

Like jamie's proverbial house of cards like this

452

00:41:16,480 --> 00:41:19,680

Here wait play my sound effect over the actual thing watch this

453

00:41:21,840 --> 00:41:22,880

Oh

454

00:41:22,880 --> 00:41:25,040

Just like that it was

455

00:41:26,000 --> 00:41:28,000

beautiful

456

00:41:28,000 --> 00:41:33,120

It looks like a big plastic bag that got deflated or something, but it's friggin

457

00:41:33,840 --> 00:41:36,800

Deck steel and for it to do that

458

00:41:37,840 --> 00:41:39,840

It's physics

459

00:41:42,240 --> 00:41:44,960

They finally got the implosion they were looking for

460

00:41:45,840 --> 00:41:49,920

But they had to stack the deck so far in favor of a failure

461

00:41:50,480 --> 00:41:52,480

This one's going to be difficult to call

462

00:41:53,040 --> 00:41:58,560

Well, this one was a bear. How do you want to call it? Well, I I think the myth as stated

463

00:41:58,720 --> 00:42:04,720

We have to conclude based on the evidence that it's busted your average tank car even under an impressive amount of vacuum pressure

464

00:42:05,040 --> 00:42:07,040

Isn't going to implode

465

00:42:07,040 --> 00:42:09,040

Agreed, but if it's

466

00:42:09,440 --> 00:42:12,080

Dented or corroded or otherwise compromised

467

00:42:12,880 --> 00:42:14,880

It could happen

468

00:42:15,600 --> 00:42:17,780

Okay, let's get the hell out of here. Okay

469

00:42:19,920 --> 00:42:23,040

We need one of those pumper cars. Yes, I totally want one