1

00:00:00,000 --> 00:00:14,780

Limited

2

00:00:14,780 --> 00:00:16,780

I

3

00:00:44,780 --> 00:00:57,100

Are you ready for the vacuum special the Heinemann abhors a vacuum

4

00:01:14,780 --> 00:01:27,300

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

5

00:01:28,200 --> 00:01:35,420

Here goes what sucks, but does not suck vacuums. That's right. How did you know that so fast?

6

00:01:35,580 --> 00:01:40,380

We just did that opener with model trains and a vacuum cleaner fair enough, okay?

7

00:01:40,380 --> 00:01:45,620

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

8

00:01:45,620 --> 00:01:51,540

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

9

00:01:51,540 --> 00:01:56,740

There's a guy he's tasked with cleaning out one of those tanker cars on a train that holds liquid

10

00:01:56,740 --> 00:02:00,700

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

11

00:02:00,700 --> 00:02:03,060

He's warming it up and it starts to rain

12

00:02:03,180 --> 00:02:10,220

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

13

00:02:10,780 --> 00:02:20,980

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

14

00:02:23,620 --> 00:02:30,340

After more than a decade of detonations totaling over 900 explosions

15

00:02:33,980 --> 00:02:38,140

For the first time the mythbusters are tackling an implosion

16

00:02:41,100 --> 00:02:44,620

And to do justice to this impressive long-running record

17

00:02:46,820 --> 00:02:53,660

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

18

00:02:57,180 --> 00:03:00,140

I mean look at this this going to be the biggest productions

19

00:03:00,140 --> 00:03:05,020

We've ever undertaken on this show causing vacuum violence on a massive

20

00:03:05,860 --> 00:03:07,860

unprecedented scale

21

00:03:08,420 --> 00:03:11,660

But first some shop-sized science an

22

00:03:12,900 --> 00:03:19,660

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

23

00:03:19,860 --> 00:03:26,900

Six steel casing meant to contain things like fuel even in case of a derailment. How could something like that?

24

00:03:27,700 --> 00:03:28,740

spontaneously

25

00:03:28,740 --> 00:03:35,180

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

26

00:03:35,180 --> 00:03:41,420

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

27

00:03:41,780 --> 00:03:47,620

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

28

00:03:48,460 --> 00:03:53,900

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

29

00:03:54,260 --> 00:03:55,900

Let me show you now

30

00:03:55,900 --> 00:04:01,500

I'm about to perform a critical action in this experiment and that is to take a little bit of the hot water and pour it into the

31

00:04:01,500 --> 00:04:06,340

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

32

00:04:07,860 --> 00:04:11,180

Now I'm about to initiate an implosion

33

00:04:11,820 --> 00:04:14,940

First thing I do is cap the can

34

00:04:15,700 --> 00:04:21,700

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

35

00:04:21,780 --> 00:04:27,980

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

36

00:04:28,500 --> 00:04:32,060

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

37

00:04:32,900 --> 00:04:35,860

Filling the container with steam pushes out the air

38

00:04:36,500 --> 00:04:41,260

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

39

00:04:41,900 --> 00:04:45,780

The steam condenses and the internal pressure drops

40

00:04:46,860 --> 00:04:49,460

Meaning the now much greater external pressure

41

00:04:50,100 --> 00:04:52,100

pushes in on the surface

42

00:04:52,100 --> 00:04:54,100

And that's bad news for the can

43

00:04:54,580 --> 00:04:58,740

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

44

00:05:04,140 --> 00:05:08,060

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

45

00:05:16,860 --> 00:05:23,500

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

46

00:05:24,260 --> 00:05:29,780

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

47

00:05:30,180 --> 00:05:33,900

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

48

00:05:34,620 --> 00:05:40,060

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

49

00:05:43,340 --> 00:05:45,340

All right now we just wait for it to boil

50

00:05:47,260 --> 00:05:51,300

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

51

00:05:51,300 --> 00:05:56,180

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

52

00:06:03,460 --> 00:06:10,420

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

53

00:06:11,460 --> 00:06:13,460

That kind of makes me nervous

54

00:06:13,460 --> 00:06:23,360

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

55

00:06:32,220 --> 00:06:37,020

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

56

00:06:38,220 --> 00:06:41,520

Imagine they're not structurally near as strong. No

57

00:06:43,500 --> 00:06:48,860

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

58

00:06:53,980 --> 00:06:59,180

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

59

00:07:03,980 --> 00:07:05,820

This is killing me

60

00:07:05,820 --> 00:07:09,740

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

61

00:07:10,180 --> 00:07:16,220

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

62

00:07:16,220 --> 00:07:19,540

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

63

00:07:22,100 --> 00:07:26,180

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

64

00:07:27,540 --> 00:07:31,900

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

65

00:07:36,140 --> 00:07:38,260

Next time we hold the camera up with Mag

66

00:07:40,700 --> 00:07:42,700

You can feel that I

67

00:07:52,780 --> 00:07:58,980

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

68

00:07:58,980 --> 00:08:00,980

That was amazing

69

00:08:04,340 --> 00:08:07,180

It was a nerve shredding display of power

70

00:08:08,020 --> 00:08:09,140

Wow

71

00:08:09,140 --> 00:08:12,140

And an ominous sign of the full-scale potential

72

00:08:12,860 --> 00:08:14,860

But Adam isn't ready to move on

73

00:08:15,580 --> 00:08:18,420

Before they can tackle the super-sized tank car

74

00:08:18,780 --> 00:08:22,940

He wants to know exactly how much negative pressure they're dealing with

75

00:08:24,140 --> 00:08:30,060

This time we're gonna do the same test again, but we're going to have a vacuum pressure gauge attached so that we can actually

76

00:08:30,460 --> 00:08:32,460

monitor what that pressure is

77

00:08:33,140 --> 00:08:36,380

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

78

00:08:36,900 --> 00:08:41,900

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

79

00:08:42,420 --> 00:08:44,420

All right, it's bouncing between

80

00:08:45,020 --> 00:08:50,540

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

81

00:08:50,860 --> 00:08:54,140

okay timing starts now and

82

00:08:55,140 --> 00:09:02,260

The vacuum gauge is already moving. That's awesome and eventually crushes in the hopes that we'll be able to apply what we learn here

83

00:09:02,700 --> 00:09:10,500

To a full-size thing eventually yep and because the only difference between screwing around and science is writing it down

84

00:09:12,100 --> 00:09:15,620

Adam plots the increase in negative pressure measured in mercury

85

00:09:16,100 --> 00:09:18,700

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

86

00:09:19,220 --> 00:09:21,220

against time and temperature

87

00:09:21,380 --> 00:09:23,380

six inches

88

00:09:24,380 --> 00:09:27,500

How much of a vacuum will crush the can is unknown

89

00:09:28,500 --> 00:09:33,700

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

90

00:09:34,780 --> 00:09:39,020

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

91

00:09:40,060 --> 00:09:45,860

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

92

00:09:46,060 --> 00:09:48,060

contingencies out there in the field

93

00:09:52,860 --> 00:09:55,820

That was just at 16 inches of mercury

94

00:09:58,140 --> 00:10:05,900

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

95

00:10:07,020 --> 00:10:13,660

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

96

00:10:14,340 --> 00:10:17,300

Considering that 30 inches of mercury is a full vacuum

97

00:10:17,780 --> 00:10:19,780

That's significant

98

00:10:20,580 --> 00:10:30,180

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

99

00:10:32,700 --> 00:10:34,700

Coming up on mythbusters

100

00:10:35,460 --> 00:10:36,580

Awesome

101

00:10:36,580 --> 00:10:41,300

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

102

00:10:42,580 --> 00:10:48,140

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

103

00:10:48,140 --> 00:10:50,140

Holy s***

104

00:11:03,740 --> 00:11:05,740

Pressure vessels

105

00:11:07,860 --> 00:11:09,860

And pressure differential

106

00:11:10,820 --> 00:11:12,820

Yeah

107

00:11:15,740 --> 00:11:20,540

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

108

00:11:25,580 --> 00:11:31,780

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

109

00:11:32,660 --> 00:11:34,180

This is gonna be cool

110

00:11:34,180 --> 00:11:40,340

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

111

00:11:44,540 --> 00:11:48,820

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

112

00:11:51,660 --> 00:11:54,300

16 inches of mercury but

113

00:11:54,660 --> 00:12:00,460

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

114

00:12:00,660 --> 00:12:04,500

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

115

00:12:04,500 --> 00:12:09,300

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

116

00:12:10,180 --> 00:12:12,180

Okay, here we go go for it

117

00:12:15,620 --> 00:12:17,620

We're gonna try and get its temperature up

118

00:12:21,100 --> 00:12:25,940

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

119

00:12:31,020 --> 00:12:34,140

Will the high pressure steam cleaner make a difference

120

00:12:35,260 --> 00:12:45,500

All right ceiling at 203 it seems so this crucial component of the mythical mishap has raised the starting temperature by 10 degrees

121

00:12:49,140 --> 00:12:52,340

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

122

00:12:54,340 --> 00:12:56,780

And the negative pressure to build

123

00:12:56,780 --> 00:12:58,780

16

124

00:13:07,540 --> 00:13:09,540

That gets you every time

125

00:13:11,060 --> 00:13:15,380

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

126

00:13:16,820 --> 00:13:18,820

There was a greater pressure differential

127

00:13:19,820 --> 00:13:21,820

Oh, yeah

128

00:13:24,780 --> 00:13:27,140

It took twice as long to implode

129

00:13:31,940 --> 00:13:33,940

And appeared more violent

130

00:13:36,340 --> 00:13:43,620

It's actually collapsing a lot more than the other one did I think we put more energy in the system with a higher temperature in the steam

131

00:13:44,620 --> 00:13:51,780

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

132

00:13:52,460 --> 00:13:56,180

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

133

00:13:56,540 --> 00:14:02,100

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

134

00:14:03,540 --> 00:14:06,740

And the drum took even more of a beating

135

00:14:07,740 --> 00:14:13,220

But behind the scenes problems are afoot, okay keep very quiet

136

00:14:13,220 --> 00:14:17,300

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

137

00:14:17,300 --> 00:14:24,280

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

138

00:14:24,280 --> 00:14:27,700

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

139

00:14:30,100 --> 00:14:32,100

RPGs

140

00:14:33,100 --> 00:14:37,580

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

141

00:14:38,180 --> 00:14:42,860

But right now this might very well be mission implosion

142

00:14:43,660 --> 00:14:45,900

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

143

00:14:49,580 --> 00:14:55,780

So what is it we need exactly well obviously a tank car one that's been decommissioned and yet is still structurally sound

144

00:14:55,780 --> 00:14:57,140

That's hard enough

145

00:14:57,140 --> 00:15:02,580

But we also need a place to implode it that implies tracks to run it on and a location

146

00:15:02,620 --> 00:15:09,780

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

147

00:15:09,780 --> 00:15:16,060

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

148

00:15:17,540 --> 00:15:21,860

With the production office facing long odds and a short deadline

149

00:15:22,260 --> 00:15:27,340

Jamie and Adam get busy drumming up more data

150

00:15:28,900 --> 00:15:31,980

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

151

00:15:32,300 --> 00:15:35,980

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

152

00:15:35,980 --> 00:15:41,820

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

153

00:15:42,900 --> 00:15:48,860

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

154

00:15:49,380 --> 00:15:52,140

To find out Jamie has been busy welding

155

00:15:53,420 --> 00:15:55,420

While Adam whips up some wooden wheels

156

00:15:57,540 --> 00:16:01,500

Almost there and gets back to his special effects roots

157

00:16:03,380 --> 00:16:07,940

There we go, I'm much happier when our experiments look apart

158

00:16:11,420 --> 00:16:13,420

Awesome

159

00:16:14,940 --> 00:16:18,380

As before they simulate the steam cleaning process

160

00:16:19,860 --> 00:16:21,860

Great for our skin

161

00:16:22,220 --> 00:16:30,820

Until the temperature maxes out 200 then they seal it up. All right cap it up and resume their nerve-wracking way

162

00:16:31,780 --> 00:16:33,780

Timers going

163

00:16:33,780 --> 00:16:35,780

Oh, hey, oh

164

00:16:38,420 --> 00:16:40,420

You can hear it boiling Oh

165

00:16:44,420 --> 00:16:47,860

You can totally hear it boiling that's awesome

166

00:16:48,860 --> 00:16:50,860

I

167

00:16:52,380 --> 00:16:58,560

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

168

00:17:04,580 --> 00:17:08,100

Okay seven minutes in we're 11 inches of mercury

169

00:17:13,900 --> 00:17:15,900

That was fantastic

170

00:17:19,540 --> 00:17:21,540

Oh

171

00:17:24,380 --> 00:17:26,380

That was fabulous

172

00:17:28,620 --> 00:17:30,620

That is awesome

173

00:17:34,260 --> 00:17:38,740

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

174

00:17:40,060 --> 00:17:42,060

another spectacular implosion

175

00:17:43,860 --> 00:17:48,380

The accurately scaled form failed faster and under less pressure

176

00:17:49,580 --> 00:17:51,580

I

177

00:17:53,180 --> 00:17:57,340

That's just awesome data that suggests this super-sized myth is right on track

178

00:17:59,500 --> 00:18:01,500

Later on mythbusters

179

00:18:03,500 --> 00:18:05,500

The tension Titans

180

00:18:08,580 --> 00:18:11,940

Will the tank car or hosts crack first

181

00:18:18,860 --> 00:18:27,860

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

182

00:18:28,780 --> 00:18:32,940

To carry out their investigations good to see it welcome to the White House

183

00:18:34,180 --> 00:18:39,340

They've managed super-sized logistical operations of massive proportions

184

00:18:42,780 --> 00:18:47,660

But in this final season farewell, they're tackling the toughest of them all

185

00:18:49,860 --> 00:18:55,780

Welcome to Oregon the end of the line for the tall tale of the imploding tank car

186

00:18:58,780 --> 00:19:03,420

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

187

00:19:04,060 --> 00:19:10,700

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

188

00:19:11,820 --> 00:19:16,540

Well, then the testing of it is going to be one of the biggest productions. We've ever undertaken on this show

189

00:19:19,020 --> 00:19:23,200

That is the biggest steam cleaner you have ever seen

190

00:19:24,180 --> 00:19:28,500

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

191

00:19:28,500 --> 00:19:32,740

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

192

00:19:36,620 --> 00:19:38,620

Let's get to crushing

193

00:19:39,140 --> 00:19:46,100

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

194

00:19:46,620 --> 00:19:48,620

bringing the heat

195

00:19:48,860 --> 00:19:54,940

This boiler is the heart of our experiment. This is a 2 million BTU fire tube style boiler

196

00:19:54,940 --> 00:20:00,060

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

197

00:20:00,060 --> 00:20:05,260

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

198

00:20:06,140 --> 00:20:08,140

360 degrees Fahrenheit

199

00:20:08,220 --> 00:20:10,220

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

200

00:20:11,420 --> 00:20:14,540

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

201

00:20:15,100 --> 00:20:21,900

Gonna go get some tank cars. It was almost impossible to locate but in a coupling made in geek heaven

202

00:20:23,660 --> 00:20:29,980

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

203

00:20:32,140 --> 00:20:37,660

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

204

00:20:38,380 --> 00:20:40,380

This

205

00:20:43,740 --> 00:20:47,260

Is our experimental baby our tank car isn't it beautiful?

206

00:20:48,460 --> 00:20:55,580

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

207

00:20:55,820 --> 00:20:57,820

It's actually almost half an inch thick

208

00:20:58,380 --> 00:21:01,580

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

209

00:21:02,300 --> 00:21:04,300

weighing in at

210

00:21:04,380 --> 00:21:07,260

67 000 pounds made from cold rolled steel

211

00:21:07,980 --> 00:21:11,260

It seems impossible that it could crush like a tin can

212

00:21:12,700 --> 00:21:14,700

To check its interior integrity

213

00:21:15,260 --> 00:21:17,260

Adam pulls the short straw

214

00:21:18,460 --> 00:21:20,860

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

215

00:21:22,140 --> 00:21:25,100

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

216

00:21:25,180 --> 00:21:28,380

But they transport all manner of different fluids and liquids

217

00:21:28,380 --> 00:21:33,020

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

218

00:21:33,500 --> 00:21:35,100

Oh, man

219

00:21:35,100 --> 00:21:37,100

You have no idea how hot it is in here

220

00:21:38,060 --> 00:21:42,620

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

221

00:21:42,780 --> 00:21:46,860

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

222

00:21:47,740 --> 00:21:49,740

The walls are 101 degrees

223

00:21:50,700 --> 00:21:54,060

A quick recce and adam's nervous, but satisfied

224

00:21:54,700 --> 00:21:56,220

It's just a shell

225

00:21:56,220 --> 00:21:58,220

There's no internal gusting at all

226

00:21:58,700 --> 00:22:00,700

And i'm talking quietly

227

00:22:01,100 --> 00:22:04,780

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

228

00:22:05,420 --> 00:22:07,420

I feel like my eardrums are bleeding

229

00:22:11,340 --> 00:22:14,460

It's loud but sound too sound

230

00:22:14,700 --> 00:22:15,740

Oh, man

231

00:22:15,740 --> 00:22:22,460

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

232

00:22:23,420 --> 00:22:24,620

What's next?

233

00:22:24,620 --> 00:22:29,260

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

234

00:22:29,660 --> 00:22:33,820

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

235

00:22:34,060 --> 00:22:39,740

We're going to try to adjust the angle and the pressure in such a way more this way that we can get as much

236

00:22:40,060 --> 00:22:42,780

Of an even coverage of the tank car as possible

237

00:22:43,900 --> 00:22:46,060

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

238

00:22:48,380 --> 00:22:53,420

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

239

00:22:53,660 --> 00:22:58,460

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

240

00:22:58,460 --> 00:23:02,540

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

241

00:23:03,420 --> 00:23:05,420

Let's hook it up

242

00:23:06,540 --> 00:23:07,660

Cool

243

00:23:07,660 --> 00:23:12,460

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

244

00:23:12,940 --> 00:23:14,940

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

245

00:23:15,900 --> 00:23:19,260

Adam plums the steel wall and inserts a vacuum gauge

246

00:23:20,460 --> 00:23:23,580

We just turn this tank car into an experimental vessel

247

00:23:24,380 --> 00:23:26,940

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

248

00:23:28,140 --> 00:23:30,620

The colossal steam cleaner is fired up

249

00:23:31,580 --> 00:23:33,820

And adam is struggling to take it all in

250

00:23:35,260 --> 00:23:37,260

I'm having one of those moments right now

251

00:23:37,660 --> 00:23:38,620

rabid

252

00:23:38,620 --> 00:23:43,180

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

253

00:23:43,820 --> 00:23:47,740

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

254

00:23:47,820 --> 00:23:51,020

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

255

00:23:51,260 --> 00:23:54,060

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

256

00:23:54,780 --> 00:24:00,540

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

257

00:24:01,580 --> 00:24:03,580

This is gonna be cool

258

00:24:08,860 --> 00:24:16,540

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

259

00:24:17,500 --> 00:24:22,300

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

260

00:24:22,380 --> 00:24:24,380

About opening

261

00:24:25,900 --> 00:24:32,220

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

262

00:24:38,380 --> 00:24:40,860

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

263

00:24:43,820 --> 00:24:50,460

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

264

00:24:51,420 --> 00:24:56,460

Something they should never have done. It's a good take a while. Yeah a lot of mass to heat up. Yeah

265

00:24:57,580 --> 00:25:04,380

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

266

00:25:04,860 --> 00:25:10,220

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

267

00:25:10,700 --> 00:25:12,700

Collapses in on itself

268

00:25:14,380 --> 00:25:17,260

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

269

00:25:17,420 --> 00:25:21,980

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

270

00:25:26,780 --> 00:25:31,340

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

271

00:25:31,340 --> 00:25:37,020

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

272

00:25:37,020 --> 00:25:42,380

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

273

00:25:43,100 --> 00:25:45,100

Here we go

274

00:25:46,060 --> 00:25:48,540

This is it I gotta climb on top of that thing

275

00:25:49,820 --> 00:25:51,820

Almost 210 degrees

276

00:25:52,300 --> 00:25:54,780

Shut the top man way then I shut the bottom valve

277

00:25:56,220 --> 00:26:00,460

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

278

00:26:05,820 --> 00:26:11,340

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

279

00:26:11,900 --> 00:26:14,940

Okay, we're sealed up here on climbing down

280

00:26:18,300 --> 00:26:20,300

You're closing the valve now

281

00:26:20,700 --> 00:26:24,620

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

282

00:26:24,940 --> 00:26:29,180

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

283

00:26:30,460 --> 00:26:32,460

Once I get back in the bunker

284

00:26:32,460 --> 00:26:34,460

It's gonna be time to make it rain

285

00:26:34,540 --> 00:26:39,820

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

286

00:26:40,380 --> 00:26:43,900

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

287

00:26:49,500 --> 00:26:53,020

Oh perfect coming up

288

00:26:54,140 --> 00:27:03,420

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

289

00:27:04,780 --> 00:27:06,780

Man that thing's so friggin big

290

00:27:10,540 --> 00:27:20,060

It's been a monumental effort. All right fire department. Let's make it rain

291

00:27:21,820 --> 00:27:27,100

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

292

00:27:28,780 --> 00:27:31,420

Cue the physics five inches of mercury

293

00:27:34,060 --> 00:27:36,060

Six

294

00:27:36,060 --> 00:27:37,340

Nice

295

00:27:37,340 --> 00:27:39,340

Climbing steadily. That's what we wanted to see

296

00:27:39,580 --> 00:27:46,140

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

297

00:27:48,940 --> 00:27:51,260

That is climbing a lot faster than our small scale

298

00:27:51,900 --> 00:27:57,180

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

299

00:27:57,500 --> 00:28:05,180

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

300

00:28:05,580 --> 00:28:08,060

Scientific territory 12 and a half. Oh

301

00:28:10,380 --> 00:28:14,700

Oh, I'm psyched the pressure differential 13

302

00:28:18,860 --> 00:28:25,420

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

303

00:28:26,860 --> 00:28:32,380

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

304

00:28:33,340 --> 00:28:35,340

17 and a half

305

00:28:37,740 --> 00:28:44,220

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

306

00:28:44,780 --> 00:28:46,940

19 and a half and the tension

307

00:28:47,900 --> 00:28:49,820

21

308

00:28:49,820 --> 00:28:51,820

Wow

309

00:28:53,980 --> 00:28:58,700

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

310

00:29:00,060 --> 00:29:02,060

23

311

00:29:02,140 --> 00:29:04,140

Damn

312

00:29:09,580 --> 00:29:11,580

25 and a half

313

00:29:12,380 --> 00:29:14,380

Holy s***

314

00:29:15,660 --> 00:29:17,900

15 minutes after sealing in the steam

315

00:29:18,780 --> 00:29:23,180

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

316

00:29:24,700 --> 00:29:26,700

26 and a quarter

317

00:29:26,860 --> 00:29:35,100

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

318

00:29:36,700 --> 00:29:38,700

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

319

00:29:39,820 --> 00:29:41,820

As the minutes tick by

320

00:29:41,820 --> 00:29:46,380

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

321

00:29:47,100 --> 00:29:49,100

26 and 5 8

322

00:29:51,340 --> 00:29:55,580

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

323

00:29:56,140 --> 00:29:58,540

Remember folks science can be boring

324

00:30:00,700 --> 00:30:05,180

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

325

00:30:10,140 --> 00:30:13,820

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

326

00:30:14,140 --> 00:30:21,260

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

327

00:30:21,500 --> 00:30:24,460

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

328

00:30:24,940 --> 00:30:27,660

This is astonishing. This is a very durable

329

00:30:28,460 --> 00:30:30,460

Durable item

330

00:30:31,820 --> 00:30:33,820

It hasn't budged

331

00:30:34,540 --> 00:30:37,740

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

332

00:30:38,940 --> 00:30:41,420

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

333

00:30:41,980 --> 00:30:48,620

We'll call it the pressure leveled off at 27 and hasn't budged and neither has the tank car

334

00:30:49,180 --> 00:30:53,660

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

335

00:30:54,460 --> 00:30:56,620

Hold the plug and let the air back in

336

00:31:00,300 --> 00:31:05,580

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

337

00:31:06,380 --> 00:31:08,380

It's not our fault

338

00:31:09,340 --> 00:31:13,900

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

339

00:31:17,820 --> 00:31:22,300

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

340

00:31:24,620 --> 00:31:28,460

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

341

00:31:29,260 --> 00:31:35,500

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

342

00:31:35,820 --> 00:31:36,700

so

343

00:31:36,700 --> 00:31:39,900

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

344

00:31:40,860 --> 00:31:42,220

You know what?

345

00:31:42,220 --> 00:31:44,620

We're not done yet. We've got back on the phone

346

00:31:44,700 --> 00:31:50,860

We've ordered another tank car as if the first one wasn't difficult enough now. Why are we going to such extreme lengths here?

347

00:31:51,260 --> 00:31:53,260

It's because despite evidence to the contrary

348

00:31:53,260 --> 00:31:59,740

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

349

00:31:59,740 --> 00:32:05,100

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

350

00:32:05,340 --> 00:32:10,780

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

351

00:32:15,420 --> 00:32:17,420

Yeah, let's crush some stuff

352

00:32:18,380 --> 00:32:20,860

With their more corroded car in place

353

00:32:21,100 --> 00:32:26,700

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

354

00:32:27,740 --> 00:32:31,420

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

355

00:32:33,580 --> 00:32:36,940

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

356

00:32:38,140 --> 00:32:42,300

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

357

00:32:42,300 --> 00:32:48,220

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

358

00:32:48,860 --> 00:32:53,820

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

359

00:32:53,820 --> 00:33:01,260

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

360

00:33:04,060 --> 00:33:06,060

That is a beautiful piece of equipment

361

00:33:07,180 --> 00:33:08,620

It's going to pull a vacuum

362

00:33:08,620 --> 00:33:13,260

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

363

00:33:13,900 --> 00:33:18,380

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

364

00:33:19,660 --> 00:33:21,660

Except it should do it in a fraction of the time

365

00:33:22,700 --> 00:33:25,020

I want it. It's an ocean. There's open

366

00:33:27,020 --> 00:33:29,020

That's what I want

367

00:33:29,900 --> 00:33:31,900

The giant vacuum pump is fast

368

00:33:32,860 --> 00:33:40,620

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

369

00:33:41,500 --> 00:33:43,500

We got a negative 25

370

00:33:44,300 --> 00:33:48,140

Negative 25 will the more corroded drums succumb?

371

00:33:52,140 --> 00:33:59,180

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

372

00:34:02,220 --> 00:34:14,540

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

373

00:34:17,260 --> 00:34:22,780

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

374

00:34:23,980 --> 00:34:30,620

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

375

00:34:32,860 --> 00:34:41,020

This was shot at 70,000 frames a second a car was dropped from 4,000 feet

376

00:34:41,740 --> 00:34:45,500

The biggest boom was 5,000 pounds of anvil

377

00:34:47,500 --> 00:34:55,040

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

378

00:35:02,460 --> 00:35:10,460

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

379

00:35:11,900 --> 00:35:20,380

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

380

00:35:21,900 --> 00:35:24,940

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

381

00:35:25,820 --> 00:35:28,220

Holding at 27 inches of mercury

382

00:35:29,180 --> 00:35:33,820

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

383

00:35:34,460 --> 00:35:36,060

squeezing

384

00:35:36,060 --> 00:35:38,060

squashing and pressing

385

00:35:41,180 --> 00:35:45,820

But the minutes tick by and it remains resolutely intact

386

00:35:48,140 --> 00:35:50,140

Still holding at 27

387

00:35:50,940 --> 00:35:52,940

Unlike their small scale

388

00:35:53,340 --> 00:35:55,340

It may not be imploding

389

00:35:55,820 --> 00:35:58,140

But it is an astonishing result

390

00:35:58,940 --> 00:36:03,100

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

391

00:36:03,180 --> 00:36:07,100

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

392

00:36:07,980 --> 00:36:13,500

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

393

00:36:15,900 --> 00:36:19,500

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

394

00:36:20,140 --> 00:36:25,900

So it just goes to show you gotta test things

395

00:36:29,340 --> 00:36:31,840

That's the sound of disappointment ladies and gentlemen

396

00:36:35,980 --> 00:36:44,380

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

397

00:36:44,540 --> 00:36:49,980

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

398

00:36:50,380 --> 00:36:55,740

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

399

00:36:56,380 --> 00:37:02,300

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

400

00:37:02,460 --> 00:37:06,940

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

401

00:37:07,660 --> 00:37:09,660

That is how we

402

00:37:09,660 --> 00:37:15,420

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

403

00:37:16,540 --> 00:37:19,340

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

404

00:37:19,900 --> 00:37:24,700

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

405

00:37:25,180 --> 00:37:28,380

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

406

00:37:29,100 --> 00:37:31,100

At least that's what we hope

407

00:37:31,180 --> 00:37:37,500

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

408

00:37:37,900 --> 00:37:45,500

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

409

00:37:47,180 --> 00:37:51,580

This is intense dropping 3200 pounds on a tank car

410

00:37:52,540 --> 00:37:56,300

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

411

00:38:02,220 --> 00:38:04,220

Bullseye

412

00:38:08,060 --> 00:38:10,060

That's ideal

413

00:38:12,860 --> 00:38:20,220

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

414

00:38:21,500 --> 00:38:25,980

The vacuum pump fires up start sucking and the pressure plunges

415

00:38:26,540 --> 00:38:30,140

Will the kink in the steel compromise the structural integrity?

416

00:38:32,700 --> 00:38:34,940

10 minutes 21 inches of mercury

417

00:38:37,500 --> 00:38:41,260

That is a hell of a vacuum pump right there. Yeah

418

00:38:41,820 --> 00:38:45,820

It's also a hell of a dent. It's a perfect dent we made. Yeah

419

00:38:47,420 --> 00:38:49,420

23 23 inches

420

00:38:53,260 --> 00:38:55,260

Come on

421

00:38:56,220 --> 00:38:58,220

23 23 inches

422

00:39:02,620 --> 00:39:04,620

Come on

423

00:39:06,460 --> 00:39:08,460

Come on you melon farmer

424

00:39:20,620 --> 00:39:22,620

Finally

425

00:39:23,580 --> 00:39:26,380

23 inches of mercury holy cow

426

00:39:35,180 --> 00:39:38,700

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

427

00:39:39,180 --> 00:39:42,780

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

428

00:39:43,180 --> 00:39:46,620

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

429

00:39:46,860 --> 00:39:52,940

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

430

00:40:01,660 --> 00:40:05,740

Man look at that that is beautiful

431

00:40:09,740 --> 00:40:15,900

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

432

00:40:16,700 --> 00:40:24,220

It's kind of hard to take it in

433

00:40:25,020 --> 00:40:30,940

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

434

00:40:31,660 --> 00:40:33,660

Oh

435

00:40:44,140 --> 00:40:50,540

We had pulled a nearly full vacuum on two 67 foot long tank cars and achieved

436

00:40:51,340 --> 00:40:53,340

Bupkus nothing

437

00:40:53,660 --> 00:41:00,060

In desperation, we dropped a 3200 pound concrete block on it and left a huge dent

438

00:41:00,380 --> 00:41:06,620

Not a recommended technique for proper care and feeding of tank car and yet it seemed to do the trick because at

439

00:41:07,420 --> 00:41:10,220

23 inches of mercury that tank car folded

440

00:41:11,500 --> 00:41:14,060

Like jamie's proverbial house of cards like this

441

00:41:15,500 --> 00:41:18,700

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

442

00:41:21,900 --> 00:41:25,580

Just like that it was beautiful

443

00:41:25,900 --> 00:41:32,140

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

444

00:41:32,780 --> 00:41:34,380

deck steel

445

00:41:34,380 --> 00:41:36,380

And for it to do that

446

00:41:36,860 --> 00:41:38,860

It's physics

447

00:41:41,260 --> 00:41:43,900

They finally got the implosion they were looking for

448

00:41:44,860 --> 00:41:48,940

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

449

00:41:49,420 --> 00:41:51,420

This one's going to be difficult to call

450

00:41:51,980 --> 00:41:57,500

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

451

00:41:57,660 --> 00:42:03,740

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

452

00:42:03,980 --> 00:42:05,980

Isn't going to implode

453

00:42:05,980 --> 00:42:07,980

I agreed, but if it's

454

00:42:08,460 --> 00:42:11,020

Dented or corroded or otherwise compromised

455

00:42:11,820 --> 00:42:13,820

It could happen

456

00:42:13,900 --> 00:42:16,780

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

457

00:42:16,780 --> 00:42:21,980

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