
NASA
SPACESTATION
LIVE

1
00:00:10,150 --> 00:00:08,629
water recovery systems fuel cells and

2
00:00:12,870 --> 00:00:10,160
other equipment on the international

3
00:00:14,709 --> 00:00:12,880
space station use packed bed reactors

4
00:00:16,630 --> 00:00:14,719
but currently none are designed to

5
00:00:17,430 --> 00:00:16,640
handle both liquid and gas at the same

6
00:00:19,429 --> 00:00:17,440
time

7
00:00:22,150 --> 00:00:19,439
with the improved understanding of how a

8
00:00:24,470 --> 00:00:22,160
packed bed two phase flow works in

9
00:00:26,470 --> 00:00:24,480
microgravity scientists could design

10
00:00:28,470 --> 00:00:26,480
more efficient lightweight thermal

11
00:00:30,310 --> 00:00:28,480
management and life support systems that

12
00:00:32,470 --> 00:00:30,320
use less energy benefiting the space

13
00:00:34,950 --> 00:00:32,480

station and future mars missions

14
00:00:36,389 --> 00:00:34,960
this new packed bed reactor experiment

15
00:00:38,470 --> 00:00:36,399
is scheduled to launch to the station

16
00:00:41,270 --> 00:00:38,480
tomorrow evening on the orbital 4

17
00:00:43,590 --> 00:00:41,280
resupply mission iss commentator lori

18
00:00:45,590 --> 00:00:43,600
meigs recently visited nasa's glenn

19
00:00:47,430 --> 00:00:45,600
research center to get an up-close look

20
00:00:50,150 --> 00:00:47,440
at this packed bed reactor prior to

21
00:00:53,510 --> 00:00:51,830
i'm here at zen technologies and joining

22
00:00:55,590 --> 00:00:53,520
me now is brian model he is the

23
00:00:57,590 --> 00:00:55,600
principal investigator from nasa glenn

24
00:00:58,549 --> 00:00:57,600
for the packed bed reactor experiment

25
00:01:00,549 --> 00:00:58,559
brian

26
00:01:02,389 --> 00:01:00,559
this is quite a contraption we see

27
00:01:04,710 --> 00:01:02,399
behind us here what is that that's all

28
00:01:06,230 --> 00:01:04,720
for science yes this is the uh

29
00:01:09,350 --> 00:01:06,240
engineering unit for the pack bed

30
00:01:10,789 --> 00:01:09,360
reactor and you can see the the reactor

31
00:01:13,190 --> 00:01:10,799
column right in the middle there right

32
00:01:14,390 --> 00:01:13,200
now it's filled with teflon beads which

33
00:01:16,149 --> 00:01:14,400
is one of the packings that we're going

34
00:01:18,550 --> 00:01:16,159
to be testing so for folks who don't

35
00:01:20,469 --> 00:01:18,560
know what is a packed bed reactor okay

36
00:01:22,310 --> 00:01:20,479
pacquiao reactor is actually one of the

37
00:01:24,870 --> 00:01:22,320
most common reactors used in industry

38
00:01:27,109 --> 00:01:24,880

today about 80 percent of the reactors

39
00:01:29,429 --> 00:01:27,119
use this type of a setup and essentially

40
00:01:31,830 --> 00:01:29,439
it's nothing more than packing that is

41
00:01:33,830 --> 00:01:31,840
fixed in a column and then you depending

42
00:01:35,510 --> 00:01:33,840
on reaction you have your gas or liquid

43
00:01:37,510 --> 00:01:35,520
or multiple liquid phases flowing

44
00:01:39,830 --> 00:01:37,520
through it the goal is to have intimate

45
00:01:41,190 --> 00:01:39,840
contact between the phases and the solid

46
00:01:43,190 --> 00:01:41,200
the solid could be

47
00:01:45,830 --> 00:01:43,200
consumed in a reaction or it could be a

48
00:01:48,310 --> 00:01:45,840
catalyst material or something like that

49
00:01:51,190 --> 00:01:48,320
so can you relate that to folks on earth

50
00:01:51,990 --> 00:01:51,200
how this relates so this is we primarily

51
00:01:54,550 --> 00:01:52,000
use

52
00:01:57,109 --> 00:01:54,560
these types of reactors in the life

53
00:01:59,990 --> 00:01:57,119
support systems on the space station uh

54
00:02:01,190 --> 00:02:00,000
both water reclamation and air

55
00:02:04,469 --> 00:02:01,200
reclamation

56
00:02:06,149 --> 00:02:04,479
so why do we need this new study okay

57
00:02:09,350 --> 00:02:06,159
most of the systems

58
00:02:11,430 --> 00:02:09,360
flying today are single phase and they

59
00:02:12,790 --> 00:02:11,440
would like to go to two phase um some of

60
00:02:15,430 --> 00:02:12,800
them even though they start out single

61
00:02:17,990 --> 00:02:15,440
phase like a liquid for instance you'll

62
00:02:20,390 --> 00:02:18,000
get bubbles trapped in the system and

63
00:02:22,630 --> 00:02:20,400

and they like to stick in the bed and we

64
00:02:24,070 --> 00:02:22,640
need a way to remove them from the bed

65
00:02:25,510 --> 00:02:24,080
because over time as the bubbles

66
00:02:27,510 --> 00:02:25,520
accumulate

67
00:02:29,670 --> 00:02:27,520
you lose that volume of the bed so the

68
00:02:32,630 --> 00:02:29,680
efficiency of the reactor goes down

69
00:02:34,869 --> 00:02:32,640
have we done anything like this before

70
00:02:37,509 --> 00:02:34,879
we have not on the space station we've

71
00:02:39,270 --> 00:02:37,519
flown this reactor uh we've done about

72
00:02:41,270 --> 00:02:39,280
450

73
00:02:42,309 --> 00:02:41,280
test points on the aircraft and we've

74
00:02:43,910 --> 00:02:42,319
done a little bit of drop tower

75
00:02:45,910 --> 00:02:43,920
experiments but this will be the first

76
00:02:47,190 --> 00:02:45,920
time in the station and what will we

77
00:02:48,790 --> 00:02:47,200
learn from this

78
00:02:52,229 --> 00:02:48,800
uh we'll learn the key things we want to

79
00:02:54,550 --> 00:02:52,239
learn are how to remove the bubbles

80
00:02:56,710 --> 00:02:54,560
uh what pressure drops we'd expect under

81
00:02:58,390 --> 00:02:56,720
float certain flow conditions

82
00:03:00,869 --> 00:02:58,400
and what kind of flow regime we'll

83
00:03:03,350 --> 00:03:00,879
experience like will it be bubbly flow

84
00:03:05,430 --> 00:03:03,360
or pulsating flow so what is it that you

85
00:03:06,949 --> 00:03:05,440
want depending on the reaction

86
00:03:09,350 --> 00:03:06,959
i would want one or the other so

87
00:03:11,350 --> 00:03:09,360
pulsating flow typically on earth has

88
00:03:13,589 --> 00:03:11,360

too much too high a shear rate but we

89
00:03:16,070 --> 00:03:13,599
can actually operate in that flow regime

90
00:03:17,589 --> 00:03:16,080
in microgravity at a much lower shear

91
00:03:19,589 --> 00:03:17,599
rate and

92
00:03:22,309 --> 00:03:19,599
actually under certain conditions we can

93
00:03:24,630 --> 00:03:22,319
get a better efficiency in microgravity

94
00:03:26,630 --> 00:03:24,640
than we could with the same bed on earth

95
00:03:28,070 --> 00:03:26,640
and is this something that is

96
00:03:29,509 --> 00:03:28,080
timely like you have to do it at a

97
00:03:30,869 --> 00:03:29,519
certain point or will this be on the

98
00:03:33,190 --> 00:03:30,879
station for a while

99
00:03:35,750 --> 00:03:33,200
uh we're going to operate this within

100
00:03:37,350 --> 00:03:35,760
about a 10 week window

101
00:03:39,830 --> 00:03:37,360
all right well thank you for showing it