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 Derricc man (
 Derricc msn helper (
 Head man (
 Wash colic (
 Camboss (
 : Mast -
 .
 : full view mast (
 : derrick (
 : mast (
 : (
 : Substructure

: prime moves

+ → Ac
 ↓
 SCR
 ↓
 Dc

mast,subst	carring sys. (
prime moves	power supply sys. (
	heisting sys. (
	drow work,traveling block
	rotating sys. (
	circulating sys. (

drilling fluid mixing sys. (

...

control & monitoring sys. (

:bob: pressure control sys. (

pipe handling sys. (

communication sys. (

fire fighting (

accommodation (

pollution protection sys. (

:

:Stand pipe

:Kick

:Bloe out

:Shear rans

:IWCF

:Drow work

— :

—

liner

liner

:Blind drilling

Dc-Dc — :

SCR —

:Dc-Dc

Dc Ac

Dc Ac

:SCR

Dc

SCR

Dc-Dc

Ac

rans

:Kill line connection

:Choke manifull

Kelly :Rod hole

:Hy drill

:Top drive

:Blind rans

:Martin decker

- :

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: Jar —

:stabilizer —

:sub —

stabilizer :reamer —

BHA —

...

casing scrappir —

: shock sub —

MWD —

dog leg —

key seat

key seat wiper

key seat

drill collar

Kelly

Semionole

()

- °

whip

:hardledges (

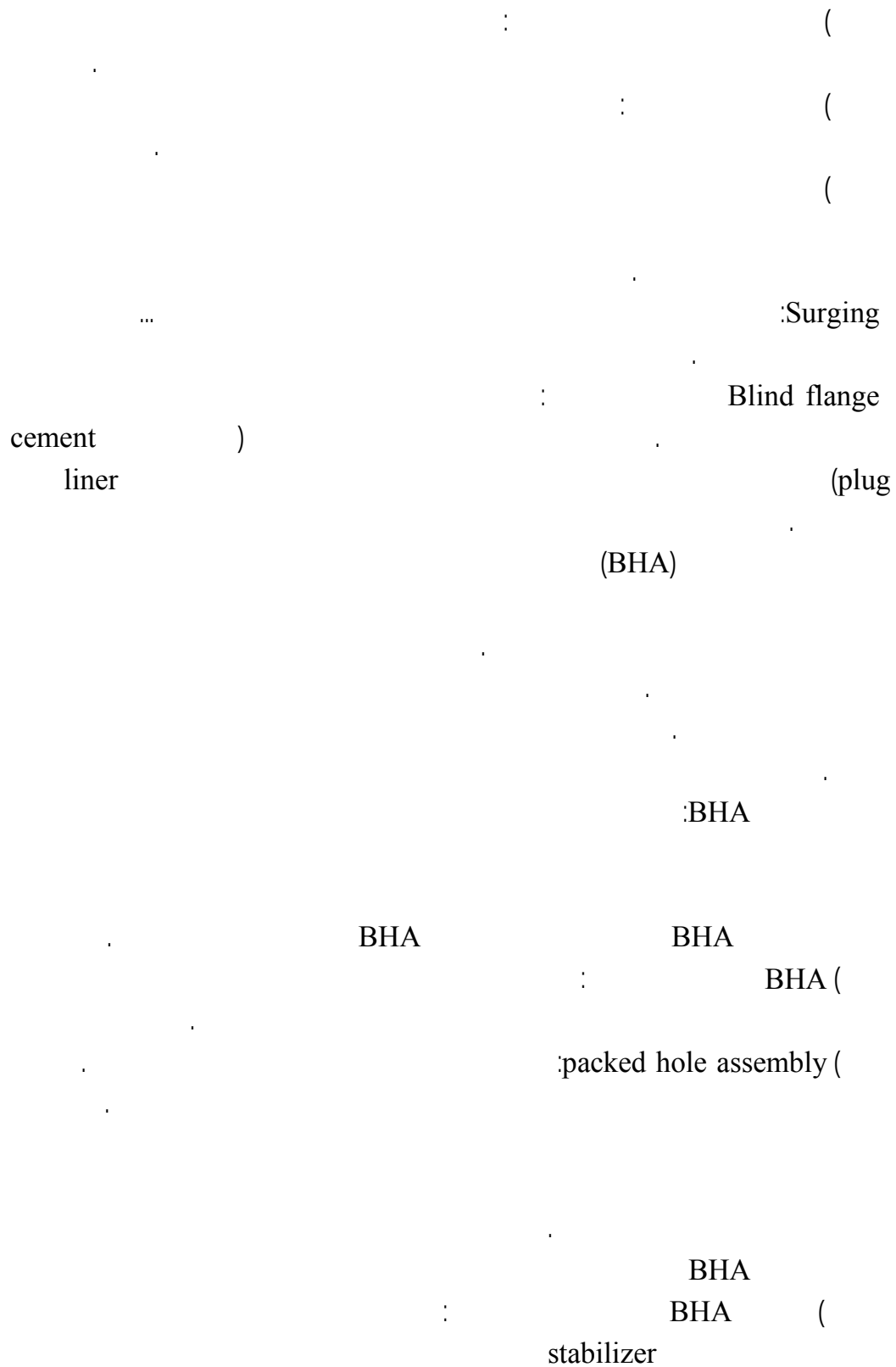
:whip stuck (

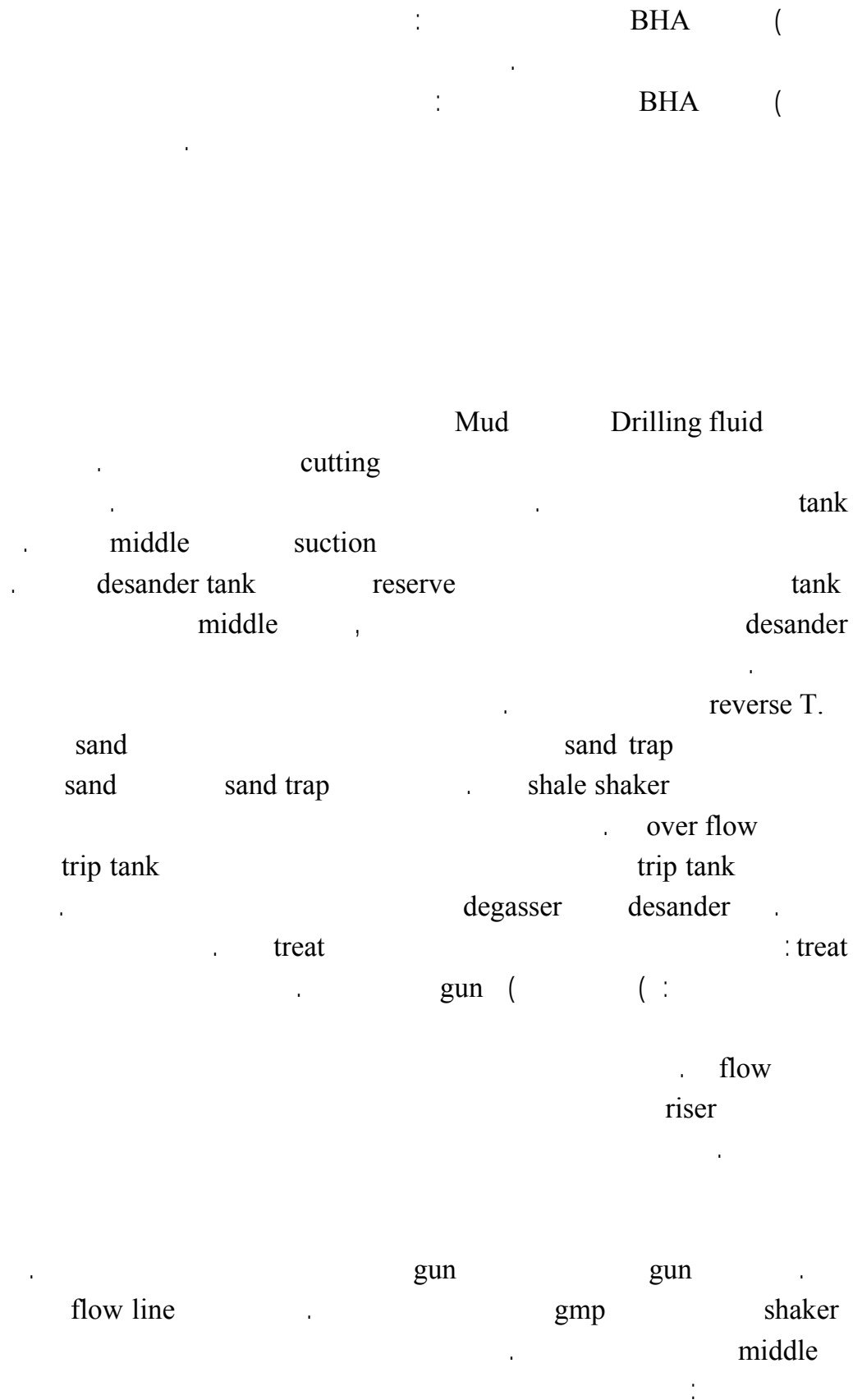
stuck

: key seat —

:key seat , doy leg

: stuck pipe :





hole cleaning (

:

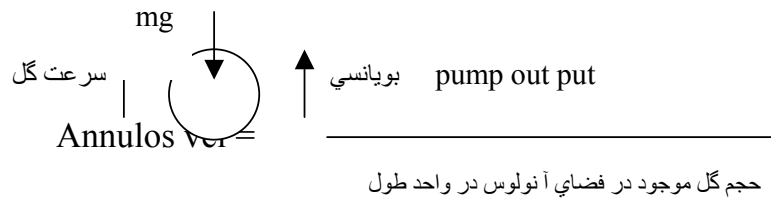
cutting

80 ft/permin

: Annulos velocity

100 f/pm

cutting «



$$\frac{OD^2 - ID^2}{1.029} = \frac{ht}{ft}$$

cutting

cutting

:

(

PDC

(

(

cake

cmc - lv

cake

pac - lv

pipe lax

(

— :

—

—

(

surge

swab

(mixed material) MM

: thixo tropic

(

mud pit

:

solid

wast management

(

cutting

—

log —

...

: corrosion

H₂S

H₂S scavenger

%

cutting

cutting

"

cutting

fpm

=A.V

=

MW × عمق

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= Density× × /

water based mud

ppm

ppm : fresh water (

water based mud

ppm : fresh water (

- ppm : salt water (

ppm

- ppm :

water based mud

ppm : fresh water (

- ppm : salt water (

ppm

- ppm :

water based mud

ppm : fresh water (

- ppm : salt water (

ppm

- ppm :

water based mud

ppm : fresh water (

- ppm : salt water (

ppm

- ppm :

. ppm ppm : fresh water (mg/l)
- ppm : salt water (g/l)
ppm
- ppm :

hard water :

- ppm : salt water (ppm
 - ppm :
 hard water :

ppm

- ppm :

hard water :

. Cl, Ca, Mg

hard water :

Cl, Ca, Mg

hard water :

Cl, Ca, Mg

Mg , Ca.

Ca

Na , Ca, Al

Mg , Ca.

Ca

Si

Scatter plot showing the relationship between $\log_{10}(\text{Concentration})$ (Y-axis) and $\log_{10}(\text{Concentration})$ (X-axis). The plot includes a dashed diagonal line representing the 1:1 relationship. Data points are labeled with element symbols: Na, Ca, Al, Mg, Ca, Si, and others. The elements are distributed across the plot, with some showing higher concentrations than others.

Na , Ca, Al

Si

: flocculant

aggriculant
 $\text{PH} = \text{NaHCO}_3$ $\text{PH} = \text{Na}_2\text{CO}_3$

aggriculant
 $\text{PH} = \text{NaHCO}_3$ $\text{PH} = \text{Na}_2\text{CO}_3$
 PH

aggriculant
 $\text{PH} = \text{NaHCO}_3$ $\text{PH} = \text{Na}_2\text{CO}_3$
 PH
 PH

PH= , NaHCO_3 PH= Na_2CO_3 PH

PH

:

:

PH

PH

cutting

$$\rho_1 v_1 + \rho_2 v_2 = \rho v$$
$$\rho_1 v_1 + \rho_2 v_2 = \rho v$$

$$\rho_1 v_1 + \rho_2 v_2 = \rho v$$

mud balanced

:MUD RHEOLOGY

: VG-meter:

thixotropic

ECD(

shear

bob

shear

thixotropic

shear rate , shear stress
shear rate , shear stress

: shear thinning

Bingham plastic (

Power law (

Hershel – Buckley(

Casson (

Robertson – stiff (

Bingham Plastic(

$\theta_{600}=40$

$\theta_{300}=25$

$$y_p = \theta_{300} - p_v = 10$$

yp	yp	yp
	.	ss
		: pv
.	pv	
		: pv
	shale , clay:	(
	lime , sand:	(
	CMC , starch:	(
.		(
		(
		: pv
	shale shaker (	
	desander , desalter , clay jector , centrifuge(	(
		(
		: yp
	solid (:	yp
	(	
	(	
		: yp
	:	(
		(
		(
		: yp
		(
	Ca , Mg	(
		(

Power Law

η : shear thinning (: η)
 η : viscoifier (: η)
 η : solid (: η)

$$\begin{pmatrix} \\ : n \end{pmatrix}$$
$$\left(\begin{array}{c} (\\ (\end{array} \right.$$

n

power law

power law , Bingham

: yp

: gel strength

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surge

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swab

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casing

: string of casing

casing

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liner (

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: burst (

: collapse (

: tension (

pore pressure < mud weight < fracture gradient

.

:

casing , loss casing :collapse (

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casing : burst (

, casing casing :shoe

.

casing : Guide shoe (

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:float shoe (

salt fill up shoe (

differential fill up shoe (

.

:

collar

float collar (

automatic fill up collar (

differential fill up collar (

stage cementing collar(

cementing

J A

A,B,C:

D,E,F:

G,H:

()

J:

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(:

(

(

— cmt class A :

depth: 0-6000 ft , T: below 170°F

250 psi at 170°F :

90 min :

— cmt class B:

depth: 0-6000 ft , T: below 170°F

200psi at 100°F :

1500 psi at 100°F :

90 min :

— cmt class C :

depth : 0-6000 ft , T: below 170°F

300 psi at 100° F :

2000psi at 100° F :

90 min :

— cmt class D

depth: 6000-10000 ft , BHST: 170-230°F

500 psi at 100°F :

2000 psi at 100°F :

90 min : — :

100 min : —

— cmt class E:

depth: 14000 ft , BHST: 230 -290° F

2000 psi :

500 psi :

154 min :

— cmt class G, H:

depth: 0-8000 ft

— cmt class J:

depth: 12000-16000 ft

thickening time :

, WCR , ,

:consistometer

:

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Cmt Accelerator

HA-5

Cmt retarder

HR-7
CMHEC

milled tooth : roller cone bits

TCI -

natural diamond- : fixed cutter bits

synthetic diamond-

PDC & TSP

TCI

milled

cutting structures

bearing

legs

tough

- °F heating& quenching - °F

- °F

case hardened

hard facing

sintered tungsten carbide

w.c . / - /

°C

- %

w.c

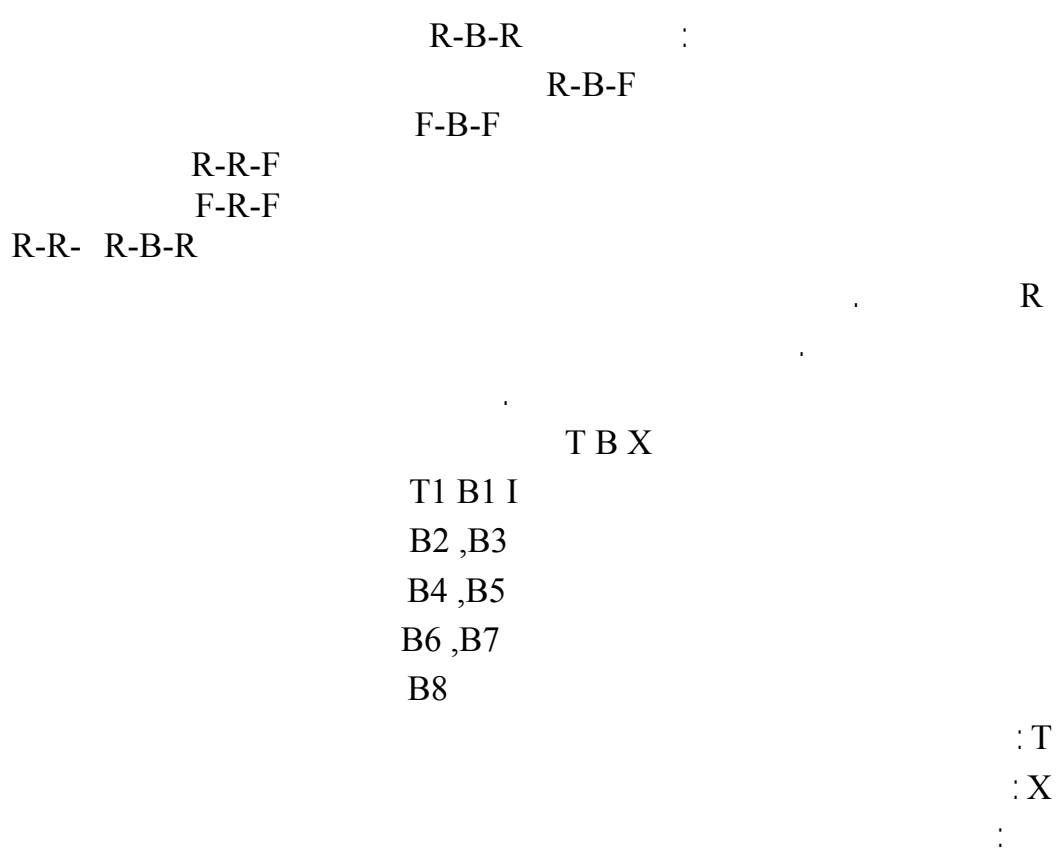
w.c

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natural industrial diamond (
: synthetic polycrystalline diamond (

:PDC

:TSP

w.c

PDC

(:
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:

:TSP (:

:PDC (

/

%

%

PDC

(
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under balanced drilling

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balanced drilling

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over balanced drilling

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solid

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:
 : PDC
 : TSP,ND
 w.c
 w.c
 gauge
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(water loss)

$$\left(\begin{array}{c} \\ \end{array} \right)$$
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LCH

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kick

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mud filtrate

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ppg

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ppg

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h min

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ppg

: kick

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kick
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chock
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fishing
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(Rope socket)
casing collapse ,packer : (:
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flow
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mud filtrate •:
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DST •
,
log
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•back off
%

fishing () back off
 wash pipe ,
 fishing trip wash over spear
 bumper jar —
 oil jar — :fishing Jar
 over shut •
 inside cutter •