



Hazard and Operability

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Hazard and Operability

Hazard adalah sesuatu yang mempunyai potensi membahayakan keselamatan, keamanan, kesehatan, dan kenyamanan orang di tempat kerja.

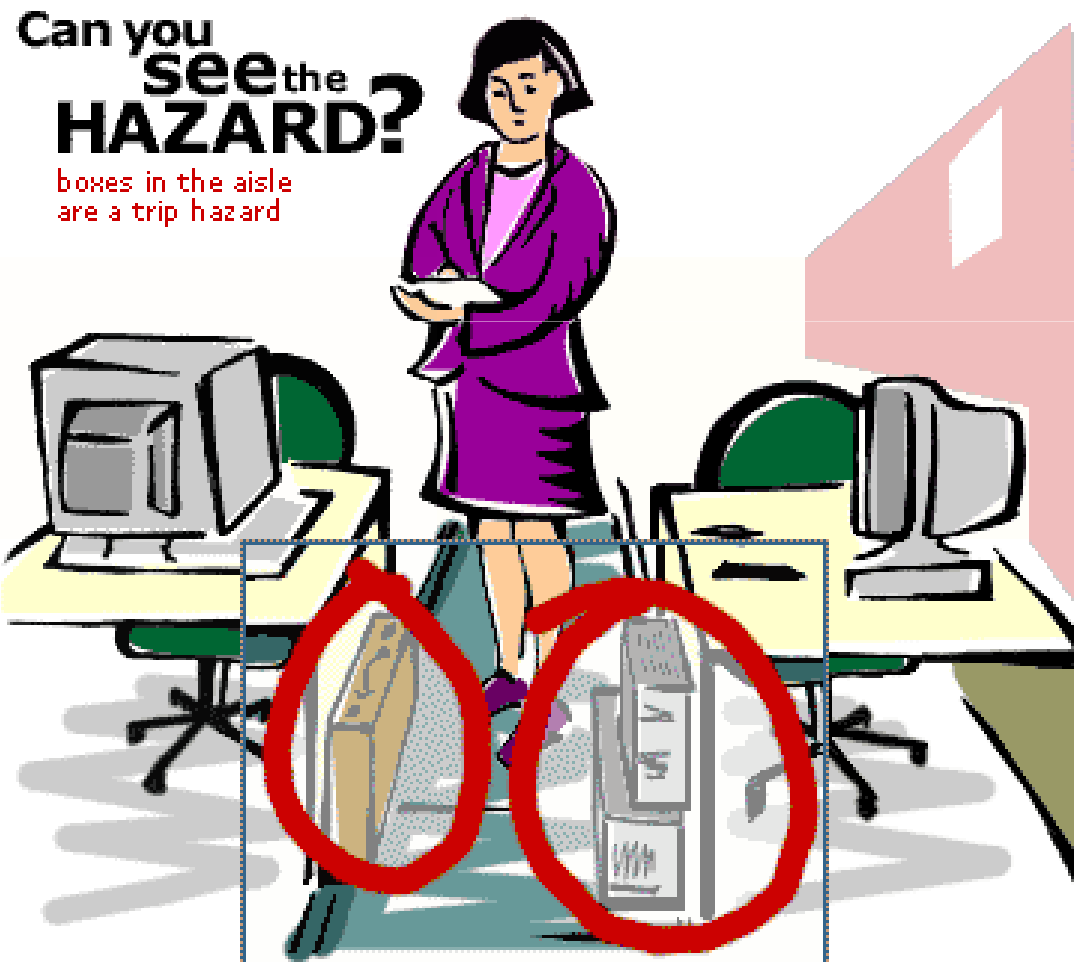
- Meliputi unsafe behavior and unsafe safety system

Hazop (Hazard and Operability)

- Cara untuk mengidentifikasi bahaya tanpa menunggu terjadinya kecelakaan kerja
- Cara memperkirakan kemungkinan dan konsekuensi suatu bahaya

Sejalan dengan PERLUnya sistem keselamatan dan keamanan kerja di Labtek X yang meliputi ruang kerja dan laboratorium.

Hazard and Operability



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Tahap pertama dan utama dalam kajian Hazop adalah identifikasi segala sesuatu yang paling penting yang dapat menyebabkan salah dan menghasilkan petaka atau masalah operasi.

Kata-kata penunjuk (guide words):

NONE, **MORE OF**, LESS OF, **REVERSE**, OTHER THAN,
PART OF, MORE THAN

Maksud Kata Penunjuk

None	<ul style="list-style-type: none">• Tidak ada aliran maju seperti yang seharusnya (No Flow)
More of	<ul style="list-style-type: none">• Melebihi nilai dari yang seharusnya (HIGHER F/T/P/C)
Less of	<ul style="list-style-type: none">• Kurang nilai dari yang seharusnya (HIGHER F/T/P/C)
Reverse	<ul style="list-style-type: none">• Aliran dalam arah berlawanan dari yang diperkirakan
Part of	<ul style="list-style-type: none">• Komposisi berbeda dari yang seharusnya (beda nisbah, hilang komponen)
More than	<ul style="list-style-type: none">• Terdapat komponen lebih dari yang seharusnya (ekstra fasa, pengotor)
Other than	<ul style="list-style-type: none">• Lain-lain seperti start up, shut down, gagal operasi

Prosedur Hazop

Severity	Significance
1	High - Fatality/serious injury hazard or hazard leading to loss of >6 months production or loss greater than \$10M
2	Medium High - Injury hazard or hazard leading to loss of 1-6 months production or loss between \$1-10M
3	Medium Low - Minor injury hazard or hazard leading to loss of 1-4 weeks production or loss between \$0.1-1M
4	Low - No injury hazard or hazard leading to loss of <1 weeks production or loss less than \$100,000

Likelihood	Significance
1	High - Hazard expected more than 1/year
2	Medium High - Hazard expected several times in the plant life.
3	Medium Low - Hazard not expected more than once in the plant life.
4	Low - Hazard not expected at all in the plant life.

Prosedur Hazop

HAZOP PROCEDURE - RISK RANKING

		Severity			
		1	2	3	4
Likelihood	1	D	D	C	A
	2	D	C	B	A
	3	C	B	A	A
	4	B	A	A	A

Ranking	Significance
A	Acceptable risk level.
B	Almost acceptable risk level. Acceptable if suitably controlled by management. Should check that suitable procedures and/or control systems are in place.
C	Undesirable risk level. Must be reduced to level B at the most by engineering or management control.
D	Unacceptable risk level. Must be reduced to level B at the most by engineering or management control.

Contoh

HAZOP STUDY ON PROPOSED OD PLANT

Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
NONE	No Flow	(1) No HC available at intermediate storage.	Loss of feed to reactor. Polymer formed in HEX with no flow.	(a) Ensure communication with intermediate storage operator. (b) Install low level alarm on settling tank LIC.	3	2	B
		(2) J1 pump fails.	As for (1).	Covered by (b).	3	2	B
		(3) Line blockage, isolation valve closed in error, or LCV fails shut.	As for (1). J1 pump overheats.	(c) Install kickback on J1 pumps. (d) Check design on J1 pump strainers.	3	2	B

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
NONE	No flow	(4) Line fracture.	As for (1). HC discharged into area adjacent to public highway.	Covered by (b). (e) Institute regular patrolling and inspection of transfer line.	2	2	C
MORE OF	More flow	(5) LCV fails open or LCV bypass open in error.	Settling tank overfills. Danger of spillage of HC. Fire hazard.	(f) Install high level alarm on LIC and check sizing of relief opposite liquid overfilling. (g) Institute locking off procedure for LCV bypass if not in use.	2	2	C

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
MORE OF	More flow	(5) LCV fails open or LCV bypass open in error.	Incomplete separation of water phase in tank, leading to problems in reactor section.	(h) Extend J2 pump suction line to 12" above tank base.	3	2	B
	More pressure	(6) Isolation valve closed in error or LCV closes with J1 pumping.	Transfer line subject to full pump delivery or surge pressure. Possibility of fracture and release of HC.	(j) Covered by (c) except when kickback blocked or isolated. Check line and FI. Install a PG upstream of LCV and an independent PG on settling tank.	2	1	D

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
MORE OF	More pressure	(7) Thermal expansion in isolated valve section due to fire or strong sunlight.	Line fracture and possible release of HC.	(k) Install thermal expansion relief on valve section.	2	2	C
	More temp.	(8) High intermediate storage temperature.	High pressure in transfer line and settling tank.	(l) Check whether there is adequate warning of high temperature at intermediate storage. If not, install.	2	2	C

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
LESS OF	Less flow	(9) Leaking flange of valved stub not blanked and leaking.	Material loss adjacent to public highway.	Covered by (e) and the checks in (j).	2	2	C
	Less temp.	(10) Winter conditions.	Water sump and drain line freeze up.	(m) Lag water sump down to drain valve and steam trace valve and drain line downstream.	4	1	A
REVERSE	Not applicable (n/a)						

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
PART OF	High water concentration in stream.	(11) High water level in intermediate storage tank.	Water sump fills up more quickly. More chance of water phase passing to reaction section.	(n) Arrange for frequent draining off of water from intermediate storage. Install high interface level alarm on sump.	4	1	A
	High concentration of lower alkanes or alkenes in stream.	(12) Disturbance on distillation columns immediately upstream of intermediate storage tank.	Higher system pressure.	(p) Check that settling tank and piping, including relief valve, will cope with sudden inflow of more volatile HCs.	4	1	A

Contoh

HAZOP STUDY ON PROPOSED OD PLANT							
Guide Word	Dev'n	Possible Causes	Consequences	Action Required	S	L	R
MORE THAN	Organic acids present	(13) As for (12).	Water sump fills up more quickly. More chance of water phase passing to reaction section.	(q) Check suitability of materials of construction.	4	1	A
OTHER	Maintenance.	(14) Equipment failure, flange leak, etc.	Line cannot be completely drained or purged.	(r) Install low-point drain and N ₂ purge point downstream of LCV. Also N ₂ vent on settling tank.	4	1	A

Formulir

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 - [Formulir bangko](#)