LAMPIRAN

Formulir *Fire & Explosion Index*

FIRE & EXPLOSION INDEX

AREA / COUNTRY	DIVISION	LOCATION	DATE
SITE	MANUFACTURING UNIT	PROCESS UNIT	
PREPARED BY:	APPROVED BY: (Superintendent)	BUILDING	
REVIEWED BY: (Management)	REVIEWED BY: (Technology Center)	REVIEWED BY: (Safety & Loss Prevention)	
MATERIALS IN PROCESS UNIT			
STATE OF OPERATION __ DESIGN __ START UP __ NORMAL OPERATION __ SHUTDOWN	BASIC MATERIAL(S) FOR MATERIAL FACTOR		

MATERIAL FACTOR (See Table 1 or Appendices A or B) Note requirements when unit temperature over 140 °F (60 °C)		
1. General Process Hazards	**Penalty Factor Range**	**Penalty Factor Used(1)**
Base Factor	1.00	1.00
A. Exothermic Chemical Reactions	0.30 to 1.25	
B. Endothermic Processes	0.20 to 0.40	
C. Material Handling and Transfer	0.25 to 1.05	
D. Enclosed or Indoor Process Units	0.25 to 0.90	
E. Access	0.20 to 0.35	
F. Drainage and Spill Control _____ gal or cu.m.	0.25 to 0.50	
General Process Hazards Factor (F_1)		
2. Special Process Hazards		
Base Factor	1.00	1.00
A. Toxic Material(s)	0.20 to 0.80	
B. Sub-Atmospheric Pressure (< 500 mm Hg)	0.50	
C. Operation In or Near Flammable Range ___ Inerted ___ Not Inerted		
1. Tank Farms Storage Flammable Liquids	0.50	
2. Process Upset or Purge Failure	0.30	
3. Always in Flammable Range	0.80	
D. Dust Explosion (See Table 3)	0.25 to 2.00	
E. Pressure (See Figure 2) Operating Pressure _____ psig or kPa gauge Relief Setting _____ psig or kPa gauge		
F. Low Temperature	0.20 to 0.30	
G. Quantity of Flammable/Unstable Material: Quantity _____ lb or kg H_C = _____ BTU/lb or kcal/kg		
1. Liquids or Gases in Process (See Figure 3)		
2. Liquids or Gases in Storage (See Figure 4)		
3. Combustible Solids in Storage, Dust in Process (See Figure 5)		
H. Corrosion and Erosion	0.10 to 0.75	
I. Leakage – Joints and Packing	0.10 to 1.50	
J. Use of Fired Equipment (See Figure 6)		
K. Hot Oil Heat Exchange System (See Table 5)	0.15 to 1.15	
L. Rotating Equipment	0.50	
Special Process Hazards Factor (F_2)		
Process Unit Hazards Factor (F_1 x F_2) = F_3		
Fire and Explosion Index (F_3 x MF = F&EI)		

(1) For no penalty use 0.00.

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PROCESS UNIT RISK ANALYSIS SUMMARY

1.	Fire & Explosion Index (F&EI)..... (See Front)	
2.	Radius of Exposure .....(Figure 7)	ft or m
3.	Area of Exposure.....	ft^2 or m^2

Safety Data Sheet (SDS) Amonium Perchlorate

ScienceLab.com
Chemicals & Laboratory Equipment

Health	2
Fire	1
Reactivity	4
Personal Protection	E

Material Safety Data Sheet
Ammonium perchlorate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ammonium perchlorate

Catalog Codes: SLA2725

CAS#: 7790-98-9

RTECS: SC7520000

TSCA: TSCA 8(b) inventory: Ammonium perchlorate

CI#: Not available.

Synonym:

Chemical Formula: NH4ClO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ammonium perchlorate	7790-98-9	100

Toxicological Data on Ingredients: Ammonium perchlorate LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

p. 1

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Flammable in presence of shocks, of heat, of reducing materials, of combustible materials, of organic materials.

Explosion Hazards in Presence of Various Substances:
Extremely explosive in presence of open flames and sparks, of shocks, of heat, of reducing materials, of organic materials. Slightly explosive in presence of acids.

Fire Fighting Media and Instructions:
Oxidizing material. Do not use water jet. Use flooding quantities of water. Avoid contact with organic materials.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Oxidizing material. Stop leak if without risk. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Take precautionary measures against electrostatic discharges. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 117.49 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 1.95 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, acetone.

Solubility:
Soluble in cold water, methanol. Partially soluble in acetone. Insoluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: Unstable.

Instability Temperature: Not available.

Conditions of Instability: No additional remark.

Incompatibility with various substances:
Extremely reactive or incompatible with reducing agents, combustible materials, organic materials. Reactive with acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Causes damage to the following organs: blood, kidneys.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short/long term degradation products are to be expected.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Ammonium Perchlorate UNNA: UN1442 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Ammonium perchlorate Massachusetts RTK: Ammonium perchlorate TSCA 8(b) inventory: Ammonium perchlorate

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS C: Oxidizing material.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R36/38- Irritating to eyes and skin.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 4

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 4

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 03:57 PM

Last Updated: 05/21/2013 12:00 PM

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Label elements

Danger

Hazard statements
Causes eye irritation
Explosive; mass explosion hazard
May cause fire or explosion; strong oxidizer

Dokumentasi Gudang Bahan Baku Kimia

Hasil Wawancara dengan Narasumber

Narasumber I

Nama : Wiwiek Utami Dewi

Jabatan: Group Leader Solid Propellant System

Tanggal : 5 Oktober 2021

1. Pada Gudang bahan kimia Pustekroket LAPAN menggunakan metode penilaian risiko apa?

   Jawaban: HIROADC

2. Kegiatan apa pada Gudang bahan kimia Pustekroket LAPAN yang paling memicu potensi bahaya khususnya kecelakaan Sehingga memerlukan perhatian khusus?

   Jawaban: Proses pengambilan dan penyimpanan bahan kimia karena jika petugas tidak menggunakan APD yang tepat dikhawatirkan dapat terpapar

3. Potensi risikonya selain itu apakah ada lagi?

   Jawaban: Pengambilan bahan kimia selain diambil secara langsung dapat diambil dengan menggunakan forklift, risiko yang dapat terjadi berupa tertabrak. Selain itu, penyimpanan tabung gas belum terdapat tali pengaman, belum tersedia secondary containment untuk menampung bahan kimia apabila terjadi kebocoran.

4. Apakah terdapat potensi terjadinya kebakaran dan ledakan di Gudang Bahan Baku Kimia?

   Jawaban: ada, seperti tidak terdapatnya system grounding apabila Gudang tersambar oleh petir dapat menimbulkan kebakaran dan api dapat memicu bahan-bahan kimia yang terdapat untuk terbakar atau meledak

5. Apakah terdapat system proteksi kebakaran?

   Jawaban : Untuk system proteksi kebakaran belum ada. Untuk system pemadaman hanya berupa APAR terdapat 2 buah APAR, masing-masing berukuran 6 kg dan 25 kg berjenis CO2, sedangkan untuk sistem alarm, detector asap, panas masih belum tersedia. Selain itu, Terdapat rambu-rambu keselamatan di dalam Gudang seperti, rambu bahan-bahan Kimia B3, rambu arah evakuasi dan sebagainya.

6. Mengapa memilih sistem pemadam menggunakan APAR dibandingkan sistem sprinkler?

   Jawaban: Karena hal ini diperhitungkan dengan sistem sprinkler menggunakan air sebagai media pemadaman nya dan di dalam Gudang bahan baku kimia terdapat beberapa bahan kimia yang reaktif terhadap air dan dapat menimbulkan bahaya selanjutnya

7. Penyimpanan bahan-bahan kimia pada Gudang menggunakan apa saja?

   Jawaban: ada yang menggunakan botol-botol kaca dengan berbagai ukuran, tabung gas, dan drum-drum kaleng yang telah dilapisi coating untuk menghambat laju korosi. Selain itu terdapat pendingin untuk menyimpan bahan kimia yang memang diharuskan di suhu rendah

8. Apakah terdapat suatu SOP apabila terjadi sebuah kecelakaan kerja, khususnya kebakaran?

   Jawaban: Sudah ada

9. Proses re stock bahan-bahan kimia pada Gudang dilakukan pada periode kapan saja?

   Jawaban: Tidak tentu karena tergantung kontrak pembelian barangnya

10. Apakah dilakukan pengecekan rutin terkait bahan kimia yang terdapat?

    Jawaban: Ada, terdapat audit dalam rentang waktu tertentu

11. Apakah dilakukan pengecekan rutin terkait kondisi tempat penyimpanan bahan-bahan kimia?

    Jawaban: iya dilakukan dan dilakukan secara tak tentu

12. Apakah dilakukan pengecekan rutin terkait sistem proteksi pada Gudang bahan kimia?

    Jawaban: Terkait baru akan dilaksanakan di Tahun ini (2021), rentang waktu 1 tahun 2 kali pengecekan

13. Standar apa yang diacu dalam Gudang bahan kimia dalam penyimpanan, peletakan, alur barang masuk dan keluar?

    Jawaban: tidak ada, standar berlaku dibuat langsung oleh pihak LAPAN

14. Standar apa yang diacu dalam system proteksi pada Gudang bahan kimia di Pustekroket LAPAN?

    Jawaban: Mengacu kepada Undang-Undang yang berlaku

Narasumber II

Nama : Fadli Sanjaya

Jabatan: Penanggung Jawab Gudang Bahan Baku Kimia

Tanggal : 21 Oktober 2021

1. Pada Gudang bahan kimia Pustekroket LAPAN menggunakan metode penilaian risiko apa?

   Jawaban: HIROADC

2. Untuk aktivitas yang memiliki potensi bahaya pada Gudang bahan baku kimia apa saja?
   Jawaban: Penyimpanan Bahan kimia dan penyusunan palet atau barang di rak
3. Kontrol yang sudah dilakukan apabila terjadi risiko bahaya di Gudang bahan baku kimia apa saja?
   Jawaban: Penggunaan APD, pemasangan rambu-rambu K3, latihan ketanggap daruratan, penggunaan spill kit untuk bahan kimia yang tumpah, dan koordinasi dengan tim pengelola bahan kimia apabila terjadi kebocoran bahan kimia, selain itu bahan-bahan kimia yang diletakkan terdapat tabel nama barang beserta lokasi rak barang
4. APD yang digunakan dalam Gudang Bahan Baku Kimia apa saja?
   Jawaban: Sarung tangan kain, Masker kain, Safety Shoes, safety helm
5. Apakah dilakukan pengecekan rutin terkait sistem proteksi pada Gudang bahan kimia?
   Jawaban: Akan direncanakan pengecekan rutin 1 tahun 2 kali pengecekan
6. Standar apa yang diacu dalam system proteksi pada Gudang bahan kimia di Pustekroket LAPAN?
   Jawaban: Mengacu kepada Undang-Undang yang berlaku

Dokumentasi Wawancara dan Diskusi dengan Narasumber

5 Oktober 2021

21 Okober 2021

9 November 2021

Daftar Bahan Berbahaya dan Beracun (B3) di Gudang Bahan Baku Kimia

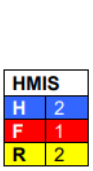
No	Nama	Nama Aplikasi di Gudang	Lokasi	Tipe (Padat/Cair/Gas)	Jumlah	Simbol		MSDS	
						Yes	No	Yes	No
1.	Hydroxyl terminated polybutadiene	Hydroxyl Terminated Polybutadiene (HTPB)	G4L1RAS1, L7RDS1	Cair	2.911.039 g				
2.	Isophorone diisocyanate	IPDI	G4L1RAS1, L7RDS1	Cair	180.538 g				
3.	Toluene diisocyanate	Toluene Diccocyanate (TDI)	G4L1RAS1, L7RDS1	Cair	572.573 g				
4.	Ammonium perchlorate	AP 50 µ, AP200 µ Prod-Line, AP 100 µ, AP 200 µ, AP 70 µ Prod-Line, Amonium Perchlorate (AP)	G4L1RAS1, L18L1RBS1	Padat	21.470.828 g				
5.	Aluminum powder	Alumunium Powder (Al), Aluminium Powder (Al) 30 µ	G4L1RAS2, L18L1RAS1	Padat	3.109.004 g				
6.	Dioctyl adipate	DOA	G4L1RAS1, L7RDS1	Cair	705.954 g				
7.	Maleic anhydride	Maleic Anhydride	G4L1RAS2, L16L1RGS1(AP?)	Padat	3.912 g				
8.	Magnesium oxide	Magnesium Oxide	G4L1RAS2	Padat	23.612 g				

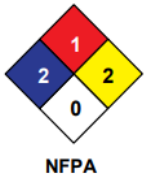
9.	Triphenyl bismuth	TPB	G4L1RAS1	Padat	3.276 g				
10.	HX-P	HX-P (SENYAWA POLYAMINE)	L17L1RES2	Cair	9.411 g				
11.	Iron (II) oxide	Ferric Oxide(FE2O3) kg	G4L1RAS1	Padat	21.443 g				
12.	Carbon Black	Black Carbon/Carbon Black	G4L1RAS1	Padat	19.336 g				
13.	Bensin	Bensin	G4L1RAS2	Cair	2.420 liter				
14.	Release Agent	Mc Lube 1725 L	G4L1RAS2	Cair	50.000 ml				
15.	Release Agent	Mc Lube 1733 H	G4L1RAS2	Cair	105.000 ml				
16.	HX-L	HX-L(senyawa polyamine)	L17L1RES2	Cair	2.658 g				
17.	3,5-dinitrosalicylic acid	DNSA	L14L1RAS1	Padat	952 g				
18.	2,2-metylene bis(4-Metyl-6-butylphenol)	2,2 Metylene bis(4-Metyl-6-butylphenol)		Padat	9.976 g				
19.	Solar	solar	Halaman lab case preparation	Cair	4.730 liter				

20.	Silica powder	Silica Prod.Line	G4L1RAS1	Padat	86.079 g				
21.		Epoxy Resin A	G4L1RAS1, L14L1RAS1	Cair	1.072.142 g				
22.		Epoxy Hardener B	G4L1RAS1, L14L1RAS1	Cair	262.557 gram				
23.		Epoxy Hardener EPH 555		Cair	216.336 g				
24.		Nitric Acid Fuming 100%	G4L1RAS1	Cair	94 liter				
25.		H2SO4 p.a 98% fuming 1 lt/botol		Cair	2 botol				
26.		HNO3 p.a 99% fuming 1 lt/botol	G4L1RAS1	Cair	1 botol				
27.		Nitric Acid 65%	G4L1RAS1	Cair	22.500 ml				
28.		Acetone p.a	G4L1RAS2	Cair	17.364 liter				
29.		Benzene p.a	G4L1RAS2	Cair	62.000 liter				
30.		Toluene p.a	G4L1RAS2	Cair	32.500 liter				

31.		Methanol Teknis		Cair	132.500 ml				
32.		Hydrogen Peroxide 35% p.a		Cair	60.500 ml				
33.		Hydrogen Peroxide Teknis		Cair	50.000 ml				
34.		Hidrogen Peroksida 30%		Cair	1.000 ml				
35.		Kerosen Avtur		Cair	809 liter				
36.		Isi Gas Nitrogen UHP 6 M3 / 150 bar		Gas	16 tabung				
37.		Isi Gas Nitrogen Teknis		Gas	24 tabung				
38.		Isi Gas Nitrogen UHP 6 M3 / 250 bar		Gas	1 tabung				
39.		Isi Gas Oksigen UHP 6 M3/250 Bar		Gas	3 tabung				
40.		Oli hidrolik		Cair	805 liter				

Hasil Perhitungan Dow's Fire & Explosion Index Bahan Kimia Aluminium Powder





Sumber: (Scientific, 2012)

AREA/COUNTRY Indonesia	***DIVISION*** PR Tekroket	***LOCATION*** Bogor	***DATE*** **Sept – Nov 2021**
BUILDING Gudang Bahan Baku Kimia		***PROCESS UNIT*** Penyimpanan Bahan Baku Kimia	
MATERIAL IN PROCESS UNIT Aluminium Powder		***BASIC MATERIAL(S) FOR MATERIAL FACTOR*** Aluminium Powder	

MATERIAL FACTOR		**24**
1. General Process Hazards	**Penalty Factor Range**	**Penalty Factor Used**
Base Factor.....	1,00	1
A. Exothermic Chemical Reactions	0,30 to 1,25	0,3
B. Endothermic Processes	0,20 to 0,40	0
C. Material Handling and Transfer	0,25 to 1,05	0
D. Enclosed or Indoor Process Units	0,25 to 0,90	0,25
E. Access	0,20 to 0,35	0
F. Drainage and Spill Control __gal or cu.m	0,25 to 0,50	0
General Process Hazards Factors (F1).....		1,55
2. Special Process Hazards		
Base Factor.....	1,00	1
A. Toxic Material(s)	0,20 to 0,80	0,4
B. Sub-Atmospheric Pressure (< 500 mm Hg)	0,50	0
C. Operation In or Near Flammable Range ____Inerted ____Not Inerted		0
1. Tank Farms Storage Flammable Liquids	0,50	
2. Process Upset or Purge Failure	0,30	
3. Always in Flammable Range	0,80	
D. Dust Explosion	0,25 to 2,00	0,25
E. Pressure Operating Pressure____psig or kPa gauge Relief Setting____psig or kPa gauge		0
F. Low Temperature	0,20 to 0,30	0
G. Quantity of Flammable/Unstable Material Quantity 6.854,18 lb Hc = 2000 BTU/lb		

1. Liquids or Gasses in Process		
2. Liquids or Gasses in Storage		
3. Combustible Solids in Storage, Dust in Process		0,03
H. Corrosion and Erosion	0,10 to 0,75	0,20
I. Leakage - Joints and Packing	0,10 to 1,50	0
J. Use of Fired Equipment		0
K. Hot Oil Heat Exchange System	0,15 to 1,15	0
L. Rotating Equipment	0,50	0
Special Process Hazards Factor (F2)…….		1,88
Process Unit Hazards Factor (F1 x F2) = F3.....		2,914
***Fire and Explosion Index* (F3 x MF = F&EI)…….**		69,936

Perhitungan *Radius of Exposure*

Radius Paparan (R) ft = Nilai F&EI x 0,84

= 69,936 x 0,84

= 58,75 ft = 17,92 m

Perhitungan *Damage Factor*

Diketahui,

Material Factor Aluminium Powder = 24

Nilai F3 = 2,914

Maka, persamaan yang digunakan (Engineers, 1994) :

$Y = 0.395755 + 0{,}096443(X) - 0.00135(X^2) - 0.00038(X^3)$

$Y = 0.395755 + 0{,}096443(2{,}914) - 0.00135(2{,}914^2) - 0.00038(2{,}914^3)$

Y = 0,67 = 67%

Sehingga damage faktornya adalah 67%

Peta Pustektroket berdasarkan aplikasi *Google Earth*

RIWAYAT HIDUP PENELITI

Rizky Aferdiansyah, dilahirkan di Bogor pada tanggal 17 Oktober 1997 dari ayah bernama Solihin dan ibu Saemah. Penulis merupakan anak ketiga dari lima bersaudara. Menyelesaikan pendidikan Sekolah Dasar di SDN Cikaret 02 lulus pada tahun 2009. Menyelesaikan pendidikan Sekolah Menengah Pertama di SMP Negeri 03 Cibinong lulus pada tahun 2012. Menyelesaikan Sekolah Menengah Atas di SMA Negeri 03 Cibinong dengan mengambil jurusan IPA lulus pada tahun 2015. Melanjutkan Pendidikan Sarjana di Universitas Negeri Jakarta Program Studi Pendidikan Teknik Mesin dengan konsentrasi *Fire Protection and Safety Engineering* lulus pada tahun 2020 dan pada tahun 2020 melanjutkan pendidikan Magister di Universitas Pertahanan Program Studi Teknologi Persenjataan.