

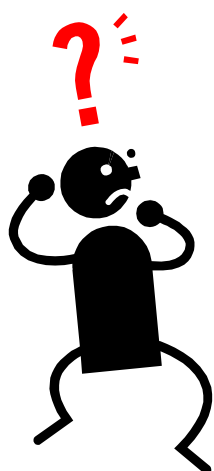
# Knovel

研究流程的最佳輔助利器  
Knovel互動式工程資料分析

飛資得知識服務



您是否有過下列的狀況...



- 從許多科研相關書籍中找到需要的大量數據，無法迅速“跨表格”比較這些數據...
- 無法將書中找到的複雜運算公式“直接”變換數據進行運算結果...
- 書中所找到有用的曲線圖表無法“活用”...
- 書中找到了有用的數據，但必須“手工”進行曲線或方程式標繪...
- 須自行用電算機或電腦進行繁複的科學公式轉換...



### Knovel簡介：為實務工作中的問題提供最佳答案

權威的內容、最佳化的檢索以及資料分析工具

- 在此一章節我們將體驗Knovel獨特的三項重要功能

#### 內容瀏覽

- 以Knovel Critical Tables 為例

#### 資料查詢

- 在此一章節我們將學習到如何透過資料分析工具的查詢來找到問題的答案

#### 基本檢索

- 在此一章節我們將瞭解如何自超過2千種手冊及參考工具書中發現答案。在說明中會強調如何整合文字於數位元化的內容中。

個人化的 Knovel – myKNOVEL

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## Knovel協助教師達成幫助學生從實務問題中學習解決方案的目標

- **何謂Knovel?** Knovel是一個透過領先的技術資料分析和搜尋工具來提供以Web為操作介面的工程學應用整合平臺，為工程師提供值得信賴的答案並藉此創造出全新解決方案。
- **獨特性：**
  - Knovel 是唯一特別針對工程學領域提供解決方案的資料庫。資料庫的架構與內容都是依照工程學領域社群的需求所設計。
  - Knovel提供在工程學領域中兼顧深度與廣度的無與倫比的內容，內容不但來自最具權威的出版社和學會，同時可以提供工程師快速且精確的解決方案。
  - Knovel最特別的就是對於內容的加值，不但可以搜尋圖表，更提供了互動式工具，讓工程師不但可以快速獲得相關資料，分析工具更可以直接應用到日常工作中。
- **使用Knovel的單位：**
  - 超過300家技術獨步全球的學術機構、研究單位及公司使用Knovel，其中有70家公司名列全球前500大企業。
  - 超過340家頂尖大學採用Knovel協助教學及研究，其中有12家名列全美前15大工程學院。
  - 亞太地區使用Knovel的知名學術機構日益增加，包括新加坡南洋理工大學、澳洲雪梨大學、香港科技大學、韓國浦項科技大學以及中國大陸的中國科學院。
  - 工程學領域學會，包括 ASME, AIChE, and ICHIME等前10大主要學會都與Knovel合作。



## 全球同步在使用Knovel的學校有...

- > 300 Universities in 40 countries
- 62% of Top 50 Universities in the World
- 12 of Top 15 US Engineering Schools
- >300 Corporate & Government Customers
- 73 of Fortune 500 companies
- Above 90% renewal rate

### Regionally **RG2**

- University of Sydney
- University of Melbourne
- University of Hong Kong
- Nanyang Technological University
- Hanyang University, Korea
- National Institute of Technologies, India

### Worldwide



### 投影片 5

RG2 Enter Names of locally competitive customers OR use logos  
 Ross Graber, 2011/1/24



# 全球同步在使用Knovel的企業有...



# Knovel的內容 – 來自於50多家國際頂尖出版社與學會組織

AASHTO 美國州公路和運輸官員協會	DECHEMA 德国化工与生物技术学会	National Ground Water Association 美國地下水協會
AIAA 美國航太學會	FASEB 美國實驗生物學聯會	PMI 國際項目管理學會
AICHe 美國化學工程師學會	IFIS 國際食品資訊服務	RSC 英國皇家化學學會
AMACOM 美國管理協會	IABSE 國際橋樑與結構工程協會	SAE International 國際自動機工程學會
AOCS 美國油脂化學學會	ICHEM 化學工程師學會	SIAM 美國工業與應用數學學會
ASHRAE 美國冷凍空調協會	IET 國際工程技術學會	SME 矿冶与探测学会
ASME 美國機械工程學會	ISA 國際自動化協會	SNAME 美國造船暨輪機工程學會
ASM International 美國材料資訊學會	IOP 英國物理學會	SPE 國際塑膠工程師學會
AEE 美國能源工程師協會	TMS 美國礦冶與材料學會	SVC 美國真空鍍膜協會
ASTM International 美國材料試驗協會	NACE International 美國防蝕工程學會	SPIE 国际光学工程学会
AWWA 美国水行业协会	NCRP 美國輻射防護與度量委員會	TRB 美國運輸研究委員會
		WEF 水環境協會





## Knovel 持續的努力在線上服務領域獲得卓越的國際獎項

- Knovel is regularly featured in top engineering & content publications



- Knovel2010 Awards



- KnovelQuotes by Industry Reporters

### Industrial Engineer April 2010 .....

“Think of Knovel’s website as a digital library – subscribers search for and find information on virtually any technical topic.” – [Jessie Jeppsson](#)

### Desktop Engineering March 2010 .....

“Like a Google for engineers, this one-stop technical source streamlines the process of finding trusted content for increased productivity and accuracy.” – [Pamela Waterman](#)

### Information Today December 2009 .....

“With continuous content additions & enhancements in features & functions, (Knovel) has become an online resource that really helps engineers find reliable technical information faster.” – [Paula J. Hane](#)



## Knovel 不同於紙本書或電子書的特性

	Knovel	E Book Company	E book via Google	Print Book
所有的內容皆出自可信的來源	✓			
內容專注於工程人員研究者的需求	✓			
整合文字檢索與互動式內容	✓			
提供可互動的表格、圖解和公式以獲得更好的輸出應用	✓			
在表格、圖解和公式中搜尋資料 – 不僅文字	✓			
轉換度量單位以搜尋更多相關結果	✓			
可以查詢特定的數值或範圍	✓			
在工程與材料主題中執行最佳化檢索以獲得具體的結果	✓			



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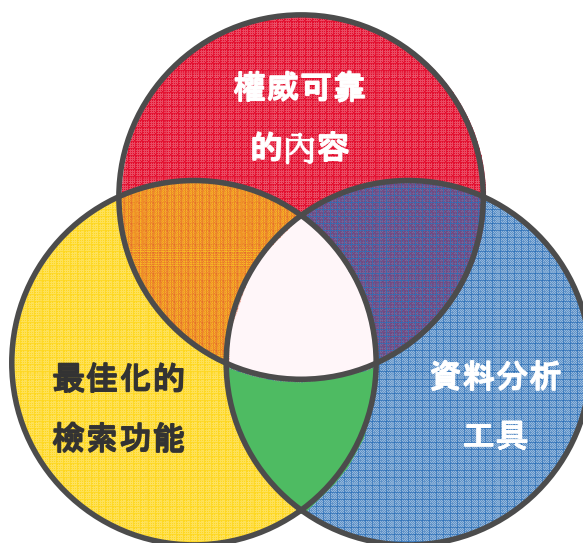
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## 大學生

- 主要專注在內容

1. 直覺式的搜尋介面
2. 圖書館目錄形式的瀏覽
3. 整合查詢功能
4. 直接獲得書中內容



## 研究生/學術研究

- 主要專注於加值的應用

1. 可以匯出做書目管理
2. 分析工具-提供互動式內容





## 來自卓越的出版社和學會的權威內容



### 經過驗證的權威內容

- 來自於經專家認可的出版社和學會夥伴所建立及出版的科學資源
- 透過客戶或產業需求所建立的專業內容
- 編輯群的7位元專家在工程領域的資深經驗與領導地位確保內容的廣度與深度，並且符合客戶需求

Knovel 提供必備的技術參考內容，包括：

- 修習時必備的基礎內容
- 經由學會和出版社審閱過的內容
- 為實務應用時所撰寫的內容
- 由工程師和實際工作人員提供的內容
- 解決實際的問題

*“Knovel’s information is credible, up-to-date and covers a wide range of technical topics”*



## 收錄28個工程學領域的可被信任的權威內容

1. 黏著劑、塗料、密封膠與油墨技術	15. 金屬與冶金技術
2. 航太與雷達工程	16. 採礦工程&萃取冶金
3. 生物化學、生物學與生物科技	17. 奈米科技
4. 陶瓷與制陶工程	18. 石油與天然氣工程
5. 化學與化學工程	19. 光學&光電
6. 土木工程與建築材料	20. 制藥、化妝品與保養品
7. 地球科學	21. 塑膠與橡膠
8. 電力與能源工程	22. 制程設計、控制&自動化
9. 電子工程與半導體	23. 安全與工業衛生
10. 環境與環境工程	24. 可持續能源與發展
11. 食品科學	25. 紡織科技
12. 工程科學與工程管理	26. 運輸工程
13. 工業工程與作業管理	27. 焊接工程&材料接合(即將出版主題)
14. 力學與機械工程	28. 電腦硬體工程(即將出版主題)



## Trusted & Validated 化學&化工 Handbooks/Reference Books

ARS Pesticide Properties Database

Corrosion Survey Database (COR-SUR)

Sax's Dangerous Properties of Industrial Materials

Hawley's Condensed Chemical Dictionary

Heat Transfer Book



Patty's Toxicology

Knovel Critical Tables

Energy Efficiency Manual

Industrial Solvents Handbook

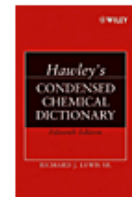
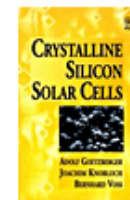


Chemical Process Equipment – Selection and Design

Yaws' Handbook of Thermodynamic and Physical Properties of Chemical Compounds

Handbook of Solvents

Handbook of Materials Selection



## Trusted & Validated 金屬&冶金技術 Handbooks/Reference Books

ASME Boiler and Pressure Vessel Code

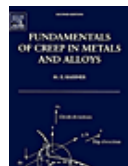
Alloy Digest – Data on World Wide Metals and Alloys

Atlas of Fatigue Curves

Corrosion Survey Database

Corrosion in the Nuclear Industry

Handbook of Composites



Handbook of Corrosion Data

Handbook of Materials Selection

Machinery's Handbook & Guide to Machinery's Handbook

Materials Properties Handbook – Titanium Alloys

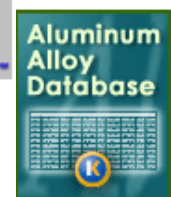
Metal Material Data Sheets

Physical Metallurgy and Advanced Materials

Smithells Metals Reference Book

Soluble Silicates – their Properties & Use

Woldmans' Engineering Alloys







## Trusted & Validated 航太&國防 Handbooks/Reference Books

Space Vehicle Dynamics and Control

Introduction to Airborne Radar

Military Handbook – ML – HDBK-5h Metallic Materials and Elements for Aerospace Vehicle Structures (Knovel Interactive Edition)

Radar Foundation for Imaging and Advanced Concepts

Radar Design Principles

Combustion Instability – Progress Astronautics/ Aeronautics

Titanium



Radar Handbook

Rocket Propulsion Elements

Modeling and Simulation of Aerospace Vehicle

Dynamics



## Trusted & Validated 石油與天然氣 Handbooks/Reference Books

Yaws' Handbook of Thermodynamic and Physical

Knovel Critical Tables

Properties of Petroleum Fluids

Civil Engineers Reference Book

Sax's Dangerous Properties of Industrial Materials



Energy Efficiency Manual

Refining Processes Handbook

2004 ASME Boiler and Pressure Vessel Code: Section II Materials

Seawater Corrosion Handbook

Corrosion Survey Database

Wiley Critical Content – Petroleum Technology

Knovel Steam Tables



Standard Handbook of Petroleum and Natural Gas

Process Piping Design Handbook – Advanced Piping Design





# 專為工程師設計的最佳化搜尋引擎



## Validated Content

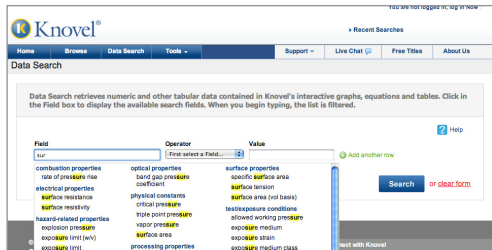
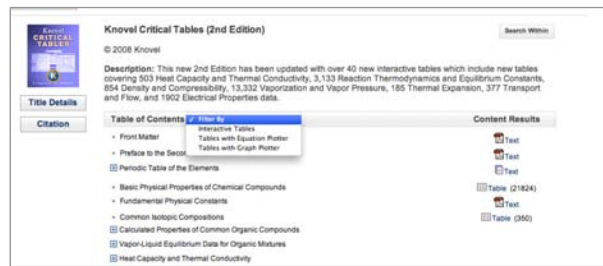
- Established, accepted science sourced from recognized societies & publishing partners
- Stringent selection process driven by customer requests and vetted by industry experts
- 7 member Editorial Advisory Board provides deep engineering experience & leadership ensuring depth & breadth of content meets customer needs

## 為工程師設計的最佳化搜尋

- 搜尋隱藏在表格、圖解和公式中的資料資料
- “瞭解”工程師的語言
- 自動化的度量單位轉換
- 提供數值或數值範圍的搜尋
- 可以執行多個欄位的查詢



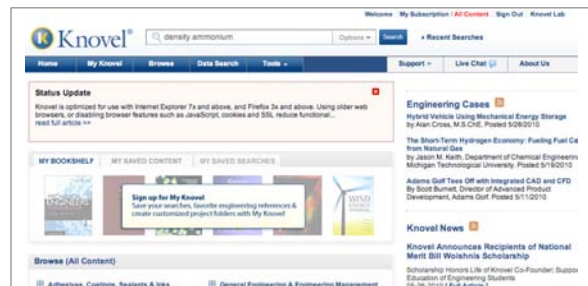
直接從內容頁(content page)中使用超過 80,000 個已數位化的互動式表格、圖解與方程式



搜尋資料資料：  
在超過 80,000 個已數位化的表格、圖解與公式中搜尋



搜尋文字：  
整合搜尋超過2,000種的手冊、參考書以及80,000個相關的數位化表格、圖解和公式





## 將資料分析工具整合在工程師的工作流程中

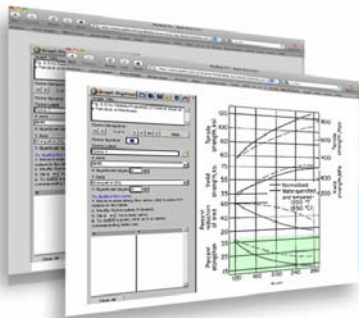


### Validated Content

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### Search Optimized for Engineers

- Finds hidden data, hidden tables, graphs, and equations
- “Understands” engineering language
- Automatically performs unit conversion
- Allows numeric range search
- Performs multi-variable search



## 將資料分析工具 整合在工程師的工作流程中

- 容易使用的工具可以做初步的計算與資料的整合
- 超過80,000種互動表格、圖解和公式
- 可以客制化並運算元據呈現方式, 同時可以輕鬆的在工作表中排序
- 可以直接在圖表中繪製一個或多個數據點和曲線
- 可以匯出資料到指定的格式和檔 (Excel, MathCAD)



## Chemistry & Chemical Engineering

- Analytical Chemistry
- Catalysis
- Dispersion & Aggregation
- Electrochemistry
- Environmental Chemistry
- General References**
- Industrial Chemistry & Chemicals
- Industrial Safety
- Physical Chemistry
- Plant Design, Operation & Energy Efficiency
- Polymer Chemistry
- Separation
- Transport Processes

### General References

All Titles **Titles with Interactive Tools**

## 顯示已有數位化的表格、圖解和公式

- Chemical Properties Handbook
- Chemical Reaction Engineering (3rd Edition)
- Chemistry of the Elements (2nd Edition)
- DIPPR 882 - Transport Properties and Related Thermodynamic Data of Binary Mixtures, Parts 1-4
- DIPPR Project 801 - Full Version
- Dean's Analytical Chemistry Handbook (2nd Edition)
- Dean's Handbook of Organic Chemistry (2nd Edition)
- Handbook of Inorganic Chemicals
- Hawley's Condensed Chemical Dictionary (14th Edition)
- International Critical Tables of Numerical Data, Physics, Chemistry and Technology (1st Electronic Edition)
- Knovel Critical Tables (2nd Edition)
- Knovel Steam Tables



# 資料分析工具公式的套用

**TABLE 15.1 Formulas for elastic stability of bars, tubes, and beams (Continued)**

5. Uniform straight bar under end load  $P$ ; both ends hinged in direction of the deflection ( $p = k_1 y$  for deflection toward  $x$ )

$$P' = \frac{\pi^2 EI}{l^2} \left( m^2 + \frac{k_1 l^4}{m^2 \pi^4 EI} \right)$$

$m$	$\alpha$
1	1
2	$1 + 4(0.23 - 0.01)$
3	$0.75 - 0.56\alpha$

This is an empirical expression carried out for values of  $\alpha$ .

6a. Straight bar, middle portion uniform, end portions tapered and alike; end load,  $I =$  moment of inertia of cross section of middle portion;  $I_1 =$  moment of inertia of end cross sections,  $I_2 =$  moment of inertia of section  $x$

$$I_1 = I \frac{I_2}{I_1}$$

for example, rectangular section tapering uniformly in width

6b.  $I_2 = I \left( \frac{w}{h} \right)^2$

for example, section of slender members fast together

(For singly tapered columns see Ref. 46.)

EquationSolver9 - Microsoft Internet Explorer

Equation Solver

Equation:

$$P' = \frac{\pi^2 EI}{l^2} \left( 9 + \frac{k_1 l^4}{9 \pi^4 EI} \left( \frac{k_1}{k_2} \right)^{0.75 - 0.56 k_1 / k_2} \right)$$

Input Values to Calculate P':

Symbol	Value	Unit (click to change)
E	10	ksi
I	1.234	in <sup>4</sup>
l	10	in
k1	0	lbf/in
k2	0	lbf/in

P': Critical Load

P' Significant Digits: 4

P' = 0.1525 lbf

Calculate

Display Plotting Controls

Select Variable and Plot P':

Variable	Definition
k1	Load Force per Unit Length of Deflection Toward Grif
k2	Load Force per Unit Length of Deflection Toward Grif
E	Modulus of Elasticity
I	Moment of Inertia
l	Length

1 Min.: 1.000 in  
1 Max.: 10.00 in  
1 Significant Digits: 4

Digitize Curve (click on the curve, or press Add Point, input a value in the table, and press Enter)

l (in)	P' (lbf)
1.557	2.209
2.061	3.589
3.069	1.619
4.363	0.7223

Plot Add Point Clear All

Zoom: 50% 100% 150%  
Axis: Linear Log  
Show: Grid Lines



# 資料分析工具表格

Table 1A SECTION III, CLASS 2 AND 3 - SECTION VII MAXIMUM ALLOWABLE STRESS VALUES FOR (*See Maximum Temperature Limits for Res				material or substance name	structure	mol. formula	mol. weight	CAS Registry no.	RTECS no.	EINECS no.	melting point (°C)	boiling point (°C)	flash point (°C)	sp. gravity	
1	Carbon steel	Sheet	SA-1008	CS-A	A-α-C	<chem>C11H9N3</chem>	183.21	26148-68-5			202				
2	Carbon steel	Sheet	SA-1008	CS-B											
3	Carbon steel	Bar	SA-675	45											
4	Carbon steel	Weld pipe	SA-124	A202A	abiectic acid	<chem>C20H30O2</chem>	302.46	514-10-3	208-178-3 (technical)		172-175 (monoclinic plates from alcohol plus water), commercial abiectic acid may be glassy or partly crystalline and may melt as low as 85				
5	Carbon steel	Plate	SA-260	A											
6	Carbon steel	Plate	SA-260	A											
7	Carbon steel	Weld pipe	SA-672	A40											
8	Carbon steel	Sheet	SA-644	A											
9	Carbon steel	Weld tube	SA-170	A											
10	Carbon steel	Weld tube	SA-170	A											
11	Carbon steel	Strip, tube	SA-179	...											
12	Carbon steel	Strip, tube	SA-182	...											
13	Carbon steel	Weld tube	SA-214	A2											
14	Carbon steel	Strip, tube	SA-206	A2											
15	Carbon steel	Weld tube	SA-557	A2											
16	Carbon steel	Weld pipe	SA-53	E/A	acenaphthene	<chem>C12H10</chem>	154.21	83-32-9	AB 1000000	201-469-6	93-95	279	1.0242 at 90°C with respect to water at 4°C		
17	Carbon steel	Weld pipe	SA-53	E/A											
18	Carbon steel	Weld pipe	SA-53	E/A											
19	Carbon steel	Weld pipe	SA-53	F	acenaphthylene	<chem>C12H8</chem>	152.20	208-96-8	AB 1254000	205-917-1	92-93	265-275	0.899 at 16°C with respect to water at 2°C		
20	Carbon steel	Strip, pipe	SA-53	S/A											
21	Carbon steel	Strip, pipe	SA-53	S/A											
22	Carbon steel	Strip, pipe	SA-100	A	acephate	<chem>C4H10NO3PS</chem>	183.17	30560-19-1	TB 4760000	250-241-2	88-90; 82-93 (technical grade)		1.35 (temperature unspecified)		
23	Carbon steel	Weld pipe	SA-125	A											
24	Carbon steel	Flanged pipe	SA-309	FFA											
25	Carbon steel	Weld pipe	SA-167	...	acetal	<chem>CH3CH(OCH2CH3)2</chem>	<chem>C8H14O2</chem>	118.18	105-57-7	AB 2800000	203-310-6	-100	102.7	-20.5	0.8254 at 20°C with respect to water at 4°C
26	Carbon steel	Weld pipe	SA-557	...											
27	Carbon steel	Bar	SA-675	50											
28	Carbon steel	Bar	SA-675	50	acetaldehyde	<chem>CH3CHO</chem>	<chem>C2H4O</chem>	44.05	75-07-0	AB 1925000	200-836-8	-123.5	20.2	-27	0.783 at 20°C
29	Carbon steel	Weld pipe	SA-124	A202B											
30	Carbon steel	Plate	SA-260	B											
31	Carbon steel	Plate	SA-260	B	acetaldehyde formylmethylhydrazone	<chem>H3CCH=NNCH3CHO</chem>	<chem>C4H8N2O</chem>	100.12	16568-02-8	LQ 8500000		5			
32	Carbon steel	Plate	SA-260	B											
33	Carbon steel	Weld pipe	SA-672	A30											
34	Carbon steel	Sheet	SA-644	B	acetaloxime	<chem>CH3CH=NOH</chem>	<chem>C2H5NO</chem>	59.07	107-29-9	AB 2975000	203-479-6	47	115		
35	Carbon steel	Plate	SAE 11020-3	P275H											
36	Carbon steel	Bar	SA-675	55											
37	Carbon steel	Bar	SA-675	55											





# 資料分析工具公式的套用 - EXCEL

2.1. Source Modes Click to View Calculation Example

**Example 2.1: Liquid Discharge through a Hole in a Tank**

**Input Data:**

Tank pressure above liquid:	0.1 barg
Pressure outside hole:	0 barg
Liquid density:	490 kg/m <sup>3</sup>
Liquid level above hole:	2 m
Hole diameter:	10 mm

**Excess Head Loss Factors:**

Entrance:	0.5
Exit:	1
Others:	0
<b>TOTAL:</b>	<b>1.5</b>

**Calculated Results:**

Hole area:	7.85E-05 m <sup>2</sup>
Equation terms:	
Pressure term:	-20.4082 m <sup>2</sup> /s <sup>2</sup>
Height term:	-19.6 m <sup>2</sup> /s <sup>2</sup>
Velocity coefficient:	1.25
<b>Exit velocity:</b>	<b>5.7 m/s</b>
<b>Mass flow:</b>	<b>0.22 kg/s</b>

**Figure 2.8. Spreadsheet output for Example 2.1: Liquid discharge through a hole in the tank.**

**Example 2.2: Liquid Trajectory from a Hole.** Consider again Example 2.1. A stream of liquid discharging from a hole in a tank will stream out of the tank and impact the ground at some distance away from the tank. In some cases the liquid stream could shoot over any diking designed to contain the liquid.

(a) If the hole is 3 m above the ground, how far will the stream of liquid shoot away from the tank?

(b) At what point on the tank will the maximum discharge distance occur? What is this distance?

**Solution:** (a) The geometry of the tank and the stream is shown in Figure 2.9. The distance away from the tank the liquid stream will impact the ground is given by

$$s = v_x t \quad (2.1.32)$$

**FIGURE 2.9. Tank geometry for Example 2.2.**

**Example 2.1 Liquid Discharge through a Hole in a Tank - Microsoft Internet Explorer**

A	B	C	D	E	F	G	H	I
1	Example 2.1: Liquid Discharge through a Hole in a Tank							
2								
3	Input Data:							
4	Tank pressure above liquid:		0.1	barg				
5	Pressure outside hole:		0	barg				
6	Liquid density:		490	kg/m <sup>3</sup>				
7	Liquid level above hole:		2	m				
8	Hole diameter:		10	mm				
9								
10	Excess Head Loss Factors:							
11	Entrance:		0.5					
12	Exit:		1					
13	Others:		0					
14	<b>TOTAL:</b>		<b>1.5</b>					
15								
16	Calculated Results:							
17								
18	Hole area:		7.85E-05	m <sup>2</sup>				
19								
20	Equation terms:							
21	Pressure term:		-20.4082	m <sup>2</sup> /s <sup>2</sup>				
22	Height term:		-19.6	m <sup>2</sup> /s <sup>2</sup>				
23	Velocity coefficient:		1.25					
24								
25	<b>Exit velocity:</b>		<b>5.7</b>	m/s				
26	<b>Mass flow:</b>		<b>0.22</b>	kg/s				
27								
28								
29								



# 資料分析工具數位化的圖表

3.48 MECHANICS OF FLUIDS

Values of (fD) for water at 50 F (velocity in fps X diameter in inches)

**Graph Title:** Fig. 3.3.24 Friction Factors for Flow in Pipes

**Click Inside Blue Ring**

**Figure 3.3.24 Friction factors for flow in pipes.**

can be maintained with care to very low Reynolds numbers, but the slightest upset will result in laminar flow if the Reynolds number is less than 2000. The Reynolds-number range between 2000 and 4000 is called the critical zone (Fig. 3.3.24). Flow in this zone is unstable, and designers of piping systems must take this into account.

**EXAMPLE.** Glycerin at 68°F (20°C) flows through a horizontal pipe 1 in in diameter and 20 ft long at a rate of 0.009 ft<sup>3</sup>/min. What is the pressure loss? First the continuity equation  $Q = vA = \rho g Q / \rho g = (0.009 / 60) \times (32.17) / (1.26 \times 10^{-3}) = 0.2306$  ft/s. The Reynolds number  $R = \rho v D / \mu = (1.26 \times 10^{-3} \times 0.2306 \times 12) / (1.48 \times 10^{-4}) = 1.000$ . Therefore, flow is laminar and  $f = 64/R = 64/1.000 = 64$ .  $K = fL/D = 64 \times 20 = 1280$ . The pressure loss  $\Delta p = K \rho v^2 / 2 = 1280 \times 1.26 \times 10^{-3} \times (0.2306)^2 / 2 = 0.357$  lb/ft<sup>2</sup> (2.728 × 10<sup>-3</sup> in Hg).

**Turbulent Flow** The friction factor for Reynolds number over 4000 is computed using the Colebrook equation:

$$\frac{1}{\sqrt{f}} = -2 \log_{10} \left( \frac{\epsilon/D}{3.7} + \frac{2.51}{Re \sqrt{f}} \right)$$

**Figure 3.3-24** is a graphical presentation of this equation (Moody, Trans. ASME, 1944, pp. 671-684). Examination of the Colebrook equation indicates that if the value of surface roughness  $\epsilon$  is small compared with the pipe diameter ( $\epsilon/D \rightarrow 0$ ), the friction factor is a function of Reynolds number only. A smooth pipe is one in which the ratio ( $\epsilon/D$ ) is small compared with  $2.51/Re \sqrt{f}$ . On the other hand, as the Reynolds number increases so that  $2.51/Re \sqrt{f} \rightarrow 0$ , the friction factor becomes a function of relative roughness only and the pipe is called a rough pipe. Thus the same pipe may be smooth under one flow condition, and rough under another. The reason for this is that as the Reynolds number increases, the thickness of the laminar sublayer decreases as shown in Fig. 3.3-23 exposing the surface roughness to flow. Values of absolute roughness  $\epsilon$  are given in Table 3.3-3. The variation

X	Y
20140	0.03027
49540	0.02715
100200	0.02571
199100	0.02472
482000	0.02399
5172000	0.02329

2. Determine flow rate  $Q$  when  $L$ ,  $D$ , and  $\Delta p$  are known.  
3. Determine pipe diameter  $D$  when  $Q$ ,  $L$ , and  $\Delta p$  are known.





## Agenda

Knovel簡介：為實務工作中的問題提供最佳答案

權威的內容、最佳化的檢索以及資料分析工具

- 在此一章節我們將體驗Knovel獨特的三項重要功能

### 內容瀏覽

- 以Knovel Critical Tables 為例

### 資料查詢

- 在此一章節我們將學習到如何透過資料分析工具的查詢來找到問題的答案

### 基本檢索

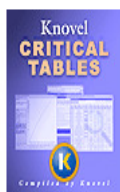
- 在此一章節我們將瞭解如何自超過2千種手冊及參考工具書中發現答案。在說明中會強調如何整合文字於數位元化的內容中。

個人化的 Knovel – myKNOVEL

- 在此一章節中我們將說明如何讓個別的教授和學生可以在Knovel中建立自己的空間



## Knovel Critical Tables. 內容瀏覽頁面



### Knovel Critical Tables (2nd Edition)

Search Within

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**Description:** This new 2nd Edition has been updated with over 40 new interactive tables which include new tables covering 503 Heat Capacity and Thermal Conductivity, 3,133 Reaction Thermodynamics and Equilibrium Constants, 854 Density and Compressibility, 13,332 Vaporization and Vapor Pressure, 185 Thermal Expansion, 377 Transport and Flow, and 1902 Electrical Properties data.

Title Details

Citation

Table of Contents

Interactive Tables

Content Results

• Front Matter		Text
• Preface to the Second Edition		Text
<input type="checkbox"/> Periodic Table of the Elements		Text
• Introduction		Text
<input type="checkbox"/> Properties of the Elements		Table (115)
• Basic Physical Properties of Chemical Compounds		Table (21824)
• Fundamental Physical Constants		Text
• Common Isotopic Compositions		Table (350)
<input type="checkbox"/> Calculated Properties of Common Organic Compounds		



Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and S...

Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Organic Substances

Table Type: Interactive Table

Search Query: (surface tension >= 25 mN/m) and (dynamic viscosity <= 0.5 mPa s)

Total Number of Search Hits: 35

Total Number of Rows: 1359

Pages:

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Display: Data Found | All Data

no.	material or substance name	viscosity (mN s/m <sup>2</sup> )	dielectric const.	dipole moment (D)	surface tension, coeff a (dyne/cm)	surface tension, coeff b (dyne/cm)
402	trans-1,2-Dichloroethylene	0.423 @ 15°C	Sort Ascending	0.7 @ 25°C; benzene	25 @ 20°C	
408	Dichloromethane	0.449 @ 15°C	Sort Descending	1.6, gas	30.41	0.1284
458	Diethyl sulfide	0.446 @ 20°C	Columns	1.52, gas	27.33	0.1106
491	Dimethylamine	0.207 @ 15°C	6.32 @ 0°C	1.03, gas	29.5	0.1265
539	Dimethyl sulfide	0.289 @ 20°C	6.2 @ 20°C	1.45 @ 25°C; benzene	26.07	0.0805
599	Ethanethiol	0.00316, gas	6.9 @ 15°C	1.57, gas	25.06	0.0793
614	Ethyl acetate	0.473 @ 15°C	6.11 @ 20°C	1.78, gas	26.29	0.1161
656	Ethylene oxide	0.3 @ 0°C	14 @ -1°C	1.88, gas	27.66	0.1664
660	Ethyl formate	0.419 @ 15°C	7.16 @ 25°C	1.94, gas	26.47	0.1315

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Done



## Agenda

Knovel簡介：為實務工作中的問題提供最佳答案

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### 個人化的 Knovel – myKNOVEL

- 在此一章節中我們將說明如何讓個別的教授和學生可以在Knovel中建立自己的空間



## 案例

一個工程師正在開發一個用於清潔在生產過程中使用的混合容器的改良液體, 我們都知道高表面張力和低黏度的溶液是比較好的清潔劑。

所以, 工程師想要搜尋一個表面張力大於等於 25 (milliNewtons/metre) 和 黏度小於等於 0.5 (milliPascal /second) 的溶液。

## 方案

Knovel 可以幫助工程師解決這個問題。工程師可以使用 **DATA**search 的功能, 指定查詢的性質和想要搜尋的數值後, 利用Knovel搜尋到適合的表格、圖解或公式。



## 選擇 DATA SEARCH

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Field

Operator

Value

Click to select a search field.

First select a Field...

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**Search**

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輸入要查詢的特性，當輸入辭彙時，系統會自動篩選出適合的資料

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Field	Operator	Value
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<b>combustion properties</b> rate of pressure rise <b>electrical properties</b> surface resistance surface resistivity <b>hazard-related properties</b> explosion pressure exposure limit (w/v) exposure limit	<b>optical properties</b> band gap pressure coefficient <b>physical constants</b> critical pressure triple point pressure vapor pressure surface area <b>processing properties</b>	<b>surface properties</b> specific surface area surface tension surface area (vol basis) <b>test/exposure conditions</b> allowed working pressure exposure medium exposure strain exposure medium class

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Data Search 檢索欄位/項目(field)

關鍵字	氣體特性	程序特性	測試/曝露條件
酸鹼特性	地理學	輻射和輻射安全	熱特性
應用	危害物相關特性	反應動力	熱力學特性
潤滑性	離子交換特性	流變學	熱力學變數
燃燒特性	材料和物質	剪力特性	組織
潛變特性	機械硬度	尺寸	韌性
電子特性	機械特性	溶解特性	輸送性質
電化學特性	光學特性	特殊指數	輸送/運輸
能源消耗	有機體	光譜特性	磨潤特性/沖蝕
環境特性	滲透性	穩定性	速率
彎曲性質	常數	化學計量特性	揮發性
疲勞性	製成條件	張力/壓縮力特性	



確認要運算的規則，以此例來說，選擇 greater than or equal to ( $\geq$ )

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Field: surface tension

Operator:  $\geq$

Value: -67.4 - 7000.0 mN/m

Units: mN/m

Buttons: Search, or clear form

Help icon



輸入數值範圍，依據選擇的單位會顯示適用的最大值與最小值

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Field: surface tension

Operator:  $\geq$

Value: 25

Units: mN/m

Buttons: Search, or clear form

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Blue arrow pointing to the value field





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Field	Operator	Value	Units
<input type="text" value="surface tension"/>	<input type="text" value="greater than or equal to"/>	<input type="text" value="25"/> -67.4 - 7000.0 mN/m	<input type="text" value="mN/m"/>
<input checked="" type="radio"/> And <input type="radio"/> Or <input type="radio"/> Not			
<input type="text" value="Click to select a search field."/>	<input type="text" value="First select a Field..."/>	<input type="text"/>	<input type="text"/>
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Field	Operator	Value	Units
<input type="text" value="surface tension"/>	<input type="text" value="greater than or equal to"/>	<input type="text" value="25"/> -67.4 - 7000.0 mN/m	<input type="text" value="mN/m"/>
<input checked="" type="radio"/> And <input type="radio"/> Or <input type="radio"/> Not			
<input type="text" value="dynamic viscosity"/>	<input "="" type="text" value="less than or equal to (&lt;="/>	<input type="text" value="0.5"/> -7.51E-10 - 1.5E16 mPa s	<input type="text" value="mPa s"/>
			<a href="#">Add another row</a>

or [clear form](#)

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檢索結果顯示在最前面兩本書並標示出來



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You searched for (surface tension >= 25 mN/m) and (dynamic viscosity <= 0.5 mPa s)

Titles:

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Titles:	Relevancy
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Search Within Sections Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Organic Substances 100 % Table (35)	100 %
Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Inorganic Substances 9 % Table (3)	9 %
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Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and S...

Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Organic Substances

Table Type: Interactive Table

Search Query: (surface tension >= 25 mN/m) and (dynamic viscosity <= 0.5 mPa s)

Total Number of Search Hits: 35

Total Number of Rows: 1359

Pages: 1 of 1

Display: Data Found | All Data

Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Organic Substances

Select Rows Filter Data Print Table Export Table View Table Notes Unit Converter Help

no.	material or substance name	viscosity (mN s/m <sup>2</sup> )	dielectric const.	dipole moment (D)	surface tension, coeff a (dyne/cm)	surface tension, coeff b (dyne/cm)
402	trans-1,2-Dichloroethylene	0.423 @ 15°C	Sort Ascending	0.7 @ 25°C; benzene	25 @ 20°C	
408	Dichloromethane	0.449 @ 15°C	Sort Descending	1.6, gas	30.41	0.1284
458	Diethyl sulfide	0.446 @ 20°C	Columns	1.52, gas	27.33	0.1106
491	Dimethylamine	0.207 @ 15°C	6.32 @ 0°C	1.03, gas	29.5	0.1265
539	Dimethyl sulfide	0.289 @ 20°C	6.2 @ 20°C	1.45 @ 25°C; benzene	26.07	0.0805
599	Ethanethiol	0.00316, gas	6.9 @ 15°C	1.57, gas	25.06	0.0793
614	Ethyl acetate	0.473 @ 15°C	6.11 @ 20°C	1.78, gas	26.29	0.1161
656	Ethylene oxide	0.3 @ 0°C	14 @ -1°C	1.88, gas	27.66	0.1664
660	Ethyl formate	0.419 @ 15°C	7.16 @ 25°C	1.94, gas	26.47	0.1315

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## Physical Properties

Table: Physical Properties

Table Type: Interactive Table

Search Query: (*dynamic viscosity* <= 0.5 mPa s) and (*surface tension* >= 25 mN/m)

Total Number of Search Hits: 18

Total Number of Rows: 1618

Number of Hidden Columns: 3

Pages:

Jump to: 1 of 1

Display: Data Found | All Data

Physical Properties

Select Rows | Filter Data | Print Table | Export Table | View Table Notes | Unit Converter | Help

molecular weight	freezing temperature (°C)	boiling temperature (°C)	evaporation rate, buty	color	dielectric constant	surface tension (mN/m)	viscosity (mPa s)	molar volume (cm <sup>3</sup> /mol)	specific gr (g/cm <sup>3</sup> )
	-112	51		colorless	15.8	26.7	0.369	71.4	1.105
	-84	77		colorless		27.3	0.34	67.1	0.8
	-99	75	7.8	colorless	13.4	29.9	0.43	88.5	0.8
	-110.8	46.3		colorless	2.6	32	0.36	60	1.293

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檢索結果可以匯出



## Interactive Table 4.10 Viscosity, Dielectric Con

Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment

Table Type: Interactive Table

Search Query: (*surface tension* >= 25 mN/m) and (*dynamic viscosity* <

Total Number of Search Hits: 35

Total Number of Rows: 1359

### Interactive Table 4.10 Viscosity, Dielectric Constant, Di

Select Rows | Filter Data | Print Table | Export Table | View Table Notes | Unit Converter | Help

no.	material or substance name	viscosity (mN s/m <sup>2</sup> )
402	trans-1,2-Dichloroethylene	0.423 @ 15
408	Dichloromethane	0.449 @ 15
458	Diethyl sulfide	0.446 @ 20
491	Dimethylamine	0.207 @ 15
539	Dimethyl sulfide	0.289 @ 20
599	Ethanthiol	0.00316, ga
614	Ethyl acetate	0.473 @ 15°C
656	Ethylene oxide	0.3 @ 0°C
660	Ethyl formate	0.419 @ 15°C

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Select an Export Option:

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- Current page of table (up to 50 rows) with rows displayed as text  
Rows displayed as text show information from a row including synonyms and some other data accessible from hyperlinks.

NEXT CLOSE HELP

614	Ethyl acetate	0.473 @ 15°C	6.11 @ 20°C	1.78, gas	26.29	0.1161
656	Ethylene oxide	0.3 @ 0°C	14 @ -1°C	1.88, gas	27.66	0.1664
660	Ethyl formate	0.419 @ 15°C	7.16 @ 25°C	1.94, gas	26.47	0.1315

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Done

41



## 選擇檔案類型 (FILETYPE)

Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment  
Table Type: Interactive Table  
Search Query: (surface tension >= 25 mN/m) and (dynamic viscosity < 20 mN s/m<sup>2</sup>)  
Total Number of Search Hits: 35  
Total Number of Rows: 1359

no.	material or substance name	viscosity (mN s/m <sup>2</sup> )
402	trans-1,2-Dichloroethylene	0.423 @ 15°C
408	Dichloromethane	0.449 @ 15°C
458	Diethyl sulfide	0.446 @ 20°C
491	Dimethylamine	0.207 @ 15°C
539	Dimethyl sulfide	0.289 @ 20°C
599	Ethaneithiol	0.00316, gas
614	Ethyl acetate	0.473 @ 15°C
656	Ethylene oxide	0.3 @ 0°C
660	Ethyl formate	0.419 @ 15°C

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42



## 決定要打開或儲存 Excel

Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment  
Table Type: Interactive Table  
Search Query: (surface tension >= 25 mN/m) and (dynamic viscosity < 20 mN s/m<sup>2</sup>)  
Total Number of Search Hits: 35  
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656	Ethylene oxide	0.3 @ 0°C
660	Ethyl formate	0.419 @ 15°C

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現在檢索結果已經儲存在個人電腦裏供後續分析應用

Microsoft Word interface showing a document titled "Dean's Handbook of Organic Chemistry (2nd Edition)". The document content is a table of physical properties for various organic substances.

no.	material or viscosity (dielectric constant, dipole moment, surface tension, coeff b (dyne/cm))
14	Acetone, lk 0.391 @ 0° 20.7 @ 25° 2.77 @ 20° 26.26 0.112
18	Acetonitrile 0.397 @ 1° 37.5 @ 20° 3.97, gas 29.58 0.1178
30	Acrylonitrile 0.35 @ 20° 33 @ 20°C 3.91, gas 28.58 0.1178
32	Allyl acetate 0.207 @ 30 28.73 0.1186
33	Allylamine 0.375 @ 25 1.3 @ 25°C 27.49 0.1287
98	Bromoethane 0.397 @ 20 13.6 @ -60 2.03, gas 26.52 0.1159
153	1-Butaneth 0.501 @ 20 5.07 @ 25° 1.54 @ 25° 28.07 0.1142
160	2-Butanone 0.428 @ 20 18.5 @ 20° 3.2 @ 30°C 26.77 0.1122
207	Butyraldehyde 0.455 @ 20 13.4 @ 26° 2.45 @ 40° 26.67 0.0925
218	Carbon disulfide 0.363 @ 20 3 @ -112°C 0, gas 35.29 0.1484
231	1-Chlorobutane 0.469 @ 10 9.07 @ -30 2.13, gas 25.97 0.1117
288	3-Chlorobutane 0.347 @ 10 8.2 @ 20°C 2, gas 25.5 0.0946
330	Cyclopentane 0.439 @ 20 1.965 @ 20 0 25.53 0.1462
394	1,1-Dichloroethane 0.505 @ 20 10.1 @ 18° 2.06, gas 27.03 0.1186
400	cis-1,2-Dichloroethane 0.467 @ 20 9.2 @ 25°C 2.95, gas 28 @ 20°C
402	trans-1,2-Dichloroethane 0.423 @ 10 2.14 @ 25° 0.7 @ 25°C 25 @ 20°C
408	Dichloromethane 0.449 @ 10 9.14 @ 20° 1.6, gas 30.41 0.1284
458	Diethyl sulfide 0.446 @ 20 5.72 @ 25° 1.52, gas 27.33 0.1106
491	Dimethyl ether 0.207 @ 10 6.32 @ 0°C 1.03, gas 29.5 0.1265
539	Dimethyl sulfoxide 0.289 @ 20 6.2 @ 20°C 1.45 @ 25° 26.07 0.0805
599	Ethanesulfone 0.00316, gr 6.9 @ 15°C 1.57, gas 25.06 0.0793
614	Ethyl acetate 0.473 @ 10 6.11 @ 20° 1.78, gas 26.29 0.1161
656	Ethylene oxide 0.3 @ 0°C 14 @ -1°C 1.88, gas 27.66 0.1664
660	Ethyl formate 0.419 @ 10 7.16 @ 25° 1.94, gas 26.47 0.1315
677	Ethyl methyl ether 0.373 @ 20 27.63 0.1286
782	Iodomethane 0.5 @ 20°C 7 @ 20°C 1.64, gas 33.42 0.1234
862	Methyl acetate 0.388 @ 20 7.03 @ 20° 1.7, gas 27.95 0.1289
906	cis-4-Methylcyclohexane 0.247 @ 20 13.3, mixed 2.7 @ 30°C 29.07 0.089, mixed isomers



資料後續的加值與應用

Microsoft Word interface showing a document titled "Knovel Solvents - A Properties Database". The document content is a table of physical properties for various solvents.

no.	name	IUPAC Name	CAS Registry no.	molecular weight	freezing temperature (°C)	boiling temperature (°C)	evaporatio	color	dielectric constant	surface tension (mN/m)	viscosity (
20	Acetyl chloride	acetyl chloride	75-36-5	78.5	-112	51		colorless	15.8	26.7	0.369
32	Acrylonitrile	prop-2-enenitrile	107-13-1	53.1	-84	77		colorless		27.3	0.34
157	Butyraldehyde	butanal	123-72-8	72.1	-99	75	7.8	colorless	13.4	29.9	0.43
163	Carbon disulfide	methanedithione	75-15-0	76.1	-110.8	46.3		colorless	2.6	32	0.36
288	Dichloromethane	dichloromethane	75-09-2	84.94	-94.92	39.6	14.5	colorless	9.1	27.89	0.4043
345	Dimethyl sulfide	methylsulfanylmethane	75-18-3	62.1	-98	37		colorless	6.3	26.5	0.28
717	Methyl formate	methyl formate	107-31-3	60.05	-100	32		colorless	8.5	25	0.328
730	Methyl propyl ketone	pentan-2-one	107-87-9	86.15	-78	102	2.4	colorless	13.6	33.87	0.489
966	Solvon ACS			122.99		71		colorless		25.9	0.49
967	Solvon AER			122.99		71		colorless		25.9	0.49
968	Solvon DR					70				25.9	0.49
969	Solvon IP					68				25.9	0.49
970	Solvon PB					70				25.9	0.49
1004	Tetrahydrofuran	oxolane	109-99-9	72.12	-108.4	65.9	6.3	colorless	7.58	26.4	0.46
1199	Lenium RV					71				25.9	0.49
1200	Lenium XS					71				25.9	0.49
1238	Eastman methyl acetate		79-20-9	74.09	-98	55.8	6			25.8	0.4
1412	Triagen					71				25.9	0.49

Knovel Solvents - A Properties Database © 2008 ChemTec Publishing





Knovel簡介：為實務工作中的問題提供最佳答案

權威的內容、最佳化的檢索以及資料分析工具

- 在此一章節我們將體驗Knovel獨特的三項重要功能

### 內容瀏覽

- 以Knovel Critical Tables 為例

### 資料查詢

- 在此一章節我們將學習到如何透過資料分析工具的查詢來找到問題的答案

### 基本檢索

- **在此一章節我們將瞭解如何自超過2千種手冊及參考工具書中發現答案。在說明中會強調如何整合文字於數位元化的內容中。**

個人化的 Knovel – myKNOVEL

- 在此一章節中我們將說明如何讓個別的教授和學生可以在Knovel中建立自己的空間



### 問題

一個石油工程師要設計一個橫跨整個廠房來運輸天然氣的管路。廠方提供要求如下：

- 運輸管路將長達10英哩
- 運輸管路的內部直徑為 6.1 英吋

### 方案

- 使用Knovel來看解決方案

## Knovel Basic Search– 直接輸入 gas flow rate

Knovel®

gas flow rate

Options Search

Home My Knovel Browse Data Search Tools

Browse

Titles by Subject | Titles A-Z

All Titles New Titles Titles with Interactive Tools

- Adhesives, Coatings, Sealants & Inks
- Aerospace & Radar Technology
- Biochemistry, Biology & Biotechnology
- Ceramics & Ceramic Engineering
- Chemistry & Chemical Engineering
- Industrial Engineering & Operations
- Mechanics & Mechanical Engineering
- Metals & Metallurgy
- Nanotechnology
- Oil & Gas Engineering

## Knovel 檢索結果– 顯示 gas flow rate 有486筆資料

COLLAPSE ALL

Number of Titles Retrieved: 486 Page: 1 of 17

You searched for (gas flow rate)

Add Search to My Knovel

**Titles:**

Gas Well Testing Handbook 100 %

Add Book to My Knovel Search Within

Sections	Relevancy	Content Type
Appendix D: Gas Flow Rate Measurement Techniques	100 %	Text
D.1 Gas Flow Rate Calculations	100 %	Text
Interactive Graphs	62 %	Table (8)
4.7 Gas Well Deliverability Testing and Production Potential Analysis	50 %	Text
5.8 Estimating Formation Characteristics from Transient Flow Test Data	31 %	Text

Show more results

## Knovel Basic Search – 增加檢索為 gas flow rate and pipeline

The screenshot shows the Knovel search interface. The search bar contains the text "gas flow rate and pipeline" and is circled in red. A red arrow points to the search bar. Below the search bar, the navigation menu includes "Home", "My Knovel", "Browse", "Data Search", and "Tools". The search results show "Number of Titles Retrieved: 486" and "Page: 1 of 17". The search query is "You searched for (gas flow rate)". A button "Add Search to My Knovel" is present. The first result is "Gas Well Testing Handbook" with a book cover image. Below the title are buttons for "Add Book to My Knovel" and "Search Within". A "Sections" list is displayed:

- Appendix D: Gas Flow Rate Measurement Techniques
- D.1 Gas Flow Rate Calculations
- Interactive Graphs
- 4.7 Gas Well Deliverability Testing and Production Potential Analysis
- 5.8 Estimating Formation Characteristics from Transient Flow Test Data

## Knovel 檢索結果 – gas flow rate and pipeline 總共有41筆

The screenshot shows the Knovel search results for "gas flow rate and pipeline". The search bar contains the text "gas flow rate and pipeline" and is circled in red. A red arrow points to the search bar. Below the search bar, the navigation menu includes "Home", "My Knovel", "Browse", "Data Search", and "Tools". The search results show "Number of Titles Retrieved: 41" and "Page: 1 of 2". The search query is "You searched for (gas flow rate and pipeline)". A button "Add Search to My Knovel" is present. The first result is "Natural Gas Engineering Handbook" with a book cover image. Below the title are buttons for "Add Book to My Knovel" and "Search Within". A table of sections is displayed:

Sections	Relevancy	Content Type
11.2.1 Sizing Pipelines	100 %	Text
11.2.2 Pipeline Wall Thickness	67 %	Text
Table 11.1 Input Data and Results Given by PipeCapacity.xls	67 %	Text
12. Special Problems	34 %	Text
12.1 Introduction	34 %	Text

[Show more results](#)

## Knovel 檢索結果– 搜尋有互動圖表內容的資料

You searched for *(gas flow rate and pipeline)*

[Add Search to My Knovel](#)

**Titles:**

[Natural Gas Engineering Handbook](#)  **Relevancy** 100 %

[Add Book to My Knovel](#) [Search Within](#)

Sections	Relevancy	Content Type
11.2.1 Sizing Pipelines	100 %	 Text
11.2.2 Pipeline Wall Thickness	67 %	 Text
Table 11.1 Input Data and Results Given by PipeCapacity.xls	67 %	 Text
12. Special Problems	34 %	 Text
12.1 Introduction	34 %	 Text

[Show more results](#)



## Knovel 檢索結果– Sizing Pipelines

You searched for *(gas flow rate and pipeline)*

[Add Search to My Knovel](#)

**Titles:**

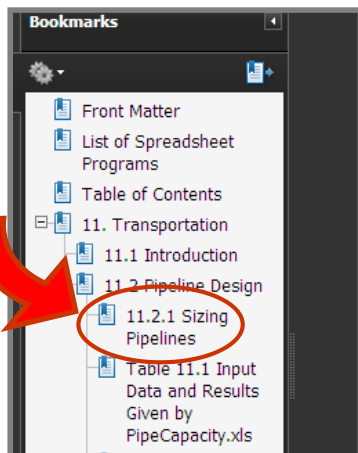
[Natural Gas Engineering Handbook](#)  **Relevancy** 100 %

[Add Book to My Knovel](#) [Search Within](#)

Sections	Relevancy	Content
11.2.1 Sizing Pipelines	100 %	 Text
11.2.2 Pipeline Wall Thickness	67 %	 Text
Table 11.1 Input Data and Results Given by PipeCapacity.xls	67 %	 Text
12. Special Problems	34 %	 Text
12.1 Introduction	34 %	 Text

[Show more results](#)





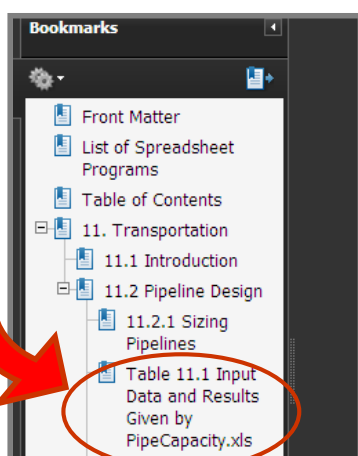
Bookmarks

- Front Matter
- List of Spreadsheet Programs
- Table of Contents
- 11. Transportation
  - 11.1 Introduction
  - 11.2 Pipeline Design
    - 11.2.1 Sizing Pipelines
    - Table 11.1 Input Data and Results Given by PipeCapacity.xls

### 11.2.1 Sizing Pipelines

The capacity of gas transmission of a pipeline is controlled mainly by its size. Complex equations have been developed for sizing natural gas pipelines in various flow conditions. The Weymouth equation, the Panhandle equation, and the Modified-Panhandle equation are used for relating the volume transmitted through a gas pipeline to the various factors involved, thus deciding the optimum pressure and pipe dimensions. From equations of this type, various combinations of pipe diameter and wall thickness for a desired rate of gas throughput can be calculated. An optimum balance is sought between pipe tonnage and pumping horsepower.

#### 11.2.1.1 Definition of Friction Factor



Bookmarks

- Front Matter
- List of Spreadsheet Programs
- Table of Contents
- 11. Transportation
  - 11.1 Introduction
  - 11.2 Pipeline Design
    - 11.2.1 Sizing Pipelines
    - Table 11.1 Input Data and Results Given by PipeCapacity.xls

### 11.2.1 Sizing Pipelines

The capacity of gas transmission of a pipeline is controlled mainly by its size. Complex equations have been developed for sizing natural gas pipelines in various flow conditions. The Weymouth equation, the Panhandle equation, and the Modified-Panhandle equation are used for relating the volume transmitted through a gas pipeline to the various factors involved, thus deciding the optimum pressure and pipe dimensions. From equations of this type, various combinations of pipe diameter and wall thickness for a desired rate of gas throughput can be calculated. An optimum balance is sought between pipe tonnage and pumping horsepower.

#### 11.2.1.1 Definition of Friction Factor



The screenshot shows a 'Bookmarks' sidebar on the left with a tree view. The selected item is 'Table 11.1 Input Data and Results Given by PipeCapacity.xls'. To the right, a table titled 'Table 11-1 Input Data and Results Given by PipeCapacity.xls(a)' is displayed. A red arrow points from a blue link 'Click to View Calculation Example' above the table to the table itself.

Table 11-1 Input Data and Results Given by PipeCapacity.xls(a)	
Instructions: 1) Update input data; 2) Run Macro Solution and view results.	
Input Data	
Pipe ID:	12.09 in
Pipe roughness:	0.0006 in
Pipeline length:	200 mi
Average temperature:	80 °F
Base temperature:	60 °F
Base pressure:	14.7 psia
Inlet pressure:	600 psia
Outlet pressure:	200 psia
Gas properties:	
Gas-specific gravity:	0.7 air = 1
Mole fraction of N <sub>2</sub> :	0
Mole fraction of CO <sub>2</sub> :	0
Mole fraction of H <sub>2</sub> S:	0
Calculated Parameter Values	

通常電子書查詢到這邊就無法繼續提供其他增值功能。

Knovel可以提供互動表表格(藍框標示的範圍)來應用於工作流程中

Knovel 互動式表格 – PipeCapacity.xls

The screenshot shows an interactive spreadsheet. The top section contains instructions and input data. A red arrow points from the instructions to the input data. The input data is as follows:

Input Data:	Value	Unit
Pipe I.D.:	12.09	in.
Pipe roughness:	0.0006	in.
Pipeline length:	200	miles
Average temperature:	80	°F
Base temperature:	60	°F
Base pressure:	14.7	psia
Inlet pressure:	600	psia
Outlet pressure:	200	psia
Gas properties:		
Gas specific gravity:	0.7	air = 1
Mole fraction of N <sub>2</sub> :	0	
Mole fraction of CO <sub>2</sub> :	0	
Mole fraction of H <sub>2</sub> S:	0	

Below this, a red arrow points to a section titled 'B) Use Weymouth Equation:'. It shows the Weymouth equation and the resulting flow capacity:

$$q_h = \frac{18.062 T_2}{p_b} \sqrt{\frac{(p_1^2 - p_2^2) D^{16.3}}{\gamma_g T Z L}}$$

Pipeline flow capacity = 1,076,035 cfh

## Knovel 互動式表格– PipeCapacity.xls – 變更為工程師實際要計算的資料

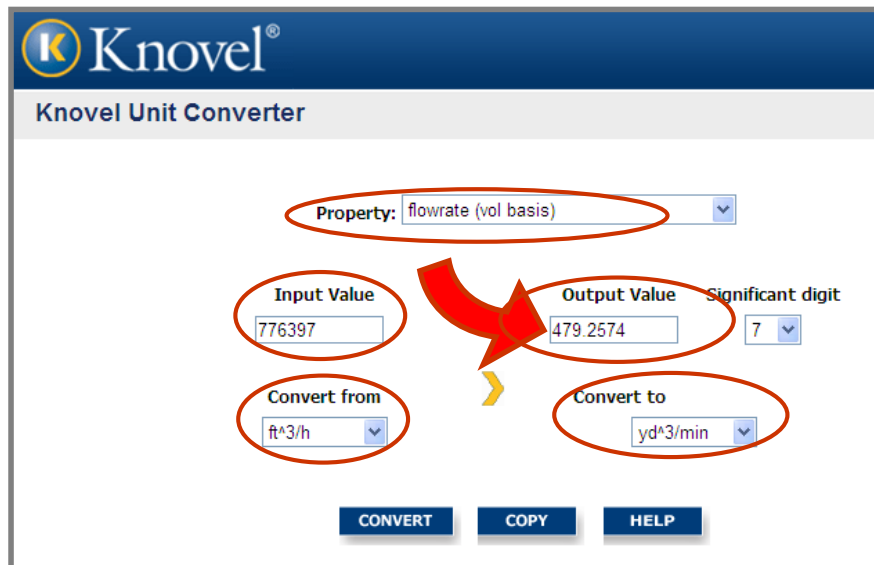
	A	B	C	D	E	F	G
1	<b>PipeCapacity.xls</b>						
2	This spreadsheet computes capacity of gas pipelines.						
3	<b>Instructions:</b> 1. Update input data in blue; 2. Run Macro Solution; 3. View results.						
4	<b>Input Data:</b>						
5		Pipe I.D.:				6.1	in.
6		Pipe roughness:				0.0006	in.
7		Pipeline length:				10	miles
8		Average temperature:				80	°F
9		Base temperature:				60	°F
10		Base pressure:				14.7	psia
11		Inlet pressure:				600	psia
12		Outlet pressure:				200	psia
13		Gas properties:					
14			Gas specific gravity:			0.7	air = 1
15			Mole fraction of N <sub>2</sub> :			0	
16			Mole fraction of CO <sub>2</sub> :			0	
17			Mole fraction of H <sub>2</sub> S:			0	

44							
45		B) Use Weymouth Equation:					
46		Pipeline flow capacity =		$q_h = \frac{18.062T_b}{p_b} \sqrt{\frac{(p_1^2 - p_2^2)D^{16/3}}{\gamma_g \bar{T} Z L}}$			
47						776,397	cfh
48							
49							

## 轉換單位– Knovel Unit Converter

44							
45		B) Use Weymouth Equation:					
46		Pipeline flow capacity =		$q_h = \frac{18.062T_b}{p_b} \sqrt{\frac{(p_1^2 - p_2^2)D^{16/3}}{\gamma_g \bar{T} Z L}}$			
47						776,397	cfh
48							
49							

The screenshot shows the Knovel website interface. At the top, there is a search bar with the text "search knovel..." and a search button. Below the search bar is a navigation menu with the following items: Home, My Knovel, Browse, Data Search, and Tools. The Tools menu is expanded, showing two options: Unit Converter and Periodic Table. The Unit Converter option is circled in red. Below the navigation menu, there is a "Back" button and the text "Natural Gas Engineering Handbook".



## Agenda

Knovel簡介：為實務工作中的問題提供最佳答案

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完成檢索後，可以個人化您的Knovel



search knovel...

Options ▾

Search

Recent Searches

My Knovel

Browse

Data Search

Tools ▾

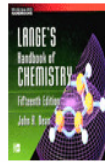
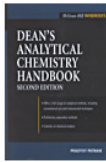
Support ▾

Live Chat

MY BOOKSHELF

MY SAVED CONTENT

MY SAVED SEARCHES



### Knovel News

#### Join Us: Green Engineering Panel Discussion & Cocktail Reception

Thought leaders discuss what being green means for engineers. February 8th, Santa Ana, CA 01-18-2010 [\[ More Information \]](#)  
[Read more...](#)

#### Knovel Boosts Roster of Publishers

SAE International, ASHRAE and 14 Other Societies and Publishers Add Content to Knovel 12-16-2009 [\[ Full Article \]](#)  
[Read more...](#)

#### Major U.S. Utility Taps Knovel's Trusted Technical Information

Knovel Helps Engineers to Solve Complex Problems Faster; Increases Efficiency of Technical Decisions 12-14-2009 [\[ Full Article \]](#)  
[Read more...](#)

[Subscribe to the RSS feed >>](#)

### Critical Status Updates

Based on our customer feedback, G.E.T. Search has been renamed and is now called Data Search, but its powerful functionality remains unchanged. Use Data Search to access numeric data from Graphs, Equ...

[read full article >>](#)

Knovel is optimized for use with Internet Explorer 7x and above, and Firefox 3x and above. Using older web browsers, or disabling browser features such as JavaScript, cookies and SSL reduce functional...

[read full article >>](#)

[Browse \(All Content\)](#)



增進使用者使用經驗

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search knovel...

Options ▾

Search

Recent Searches

My Knovel

Browse

Data Search

Tools ▾

Support ▾

Live Chat

About

[COLLAPSE ALL](#)

Number of Titles Retrieved: 98 Page: 1 of 4

You searched for (wind turbine)



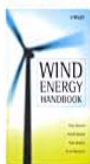
Titles:

Relevancy



Wind Energy Handbook

100 %



Sections

Relevancy

Content Type

9.3.2 Wind-Turbine Noise

100 %

3.10 The Aerodynamics of a Wind Turbine in Steady Yaw

93 %

4. Wind-Turbine Performance

93 %

4.6 Wind-Turbine Field Testing

93 %

4.6.2 Information Sources for Wind-Turbine Testing

93 %

[Show more results](#)



Wind Energy Conversion 1996

78 %





search knovel...

Options

Search

Recent Searches

My Knovel

Browse

Data Search

Tools

Support

Live Chat

My Knovel ? Help

Folders + Add a New Folder

Unfiled Items (25)

- Hepta Hydrate Project (5)
- structural design (5)
- Thermal Radiation Project (5)
- Unfiled Items (25)

Aggregated Content

- My Saved Searches (16)
- My Bookshelf (11)
- My Saved Content (13)

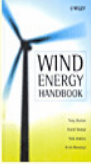
Titles (8) | Saved Content (6) | Saved Searches (11)

Move to Folder

Select the folder you wish to move selected items to:

Hepta Hydrate Project

Cancel OK

Folder Content	Date	Type
<input checked="" type="checkbox"/> 	Jan. 25, 2010	BOOK

**Wind Energy Handbook**  
 By: Burton, Tony; Sharpe, David; Jenkins, Nick; Bossanyi, Ervin  
 With coverage ranging from practical concerns about component design to the economic importance of sustainable power sources, this recently Knovelized book now includes 95 Digitized Graphs and will be an asset to engineers, turbine designers, wind energy consultants and graduate engineering



### Knovel User Registration – Knovel Administrator Benefits

Knovel's new Authentication and management system features support for user profiles and departmental cost accounting.

- Who are the end users of your Knovel community
- In what department and/or location do your Knovel end users reside
- Empower yourself and manage your Knovel community via the Administrative Toolkit
- Create customized monthly end-user statistics by sessions and number of registered users
- Access to reports anytime
- Message to your users on their Knovel home page







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**Knovel News**

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**Knovel Boosts Roster of Publishers**

SAE International, ASHRAE and 14 Other Societies and Publishers Add Content to Knovel 12-16-2009 [Full Article]  
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Please create your Knovel profile to access content and take advantage of the new "Personalization" features.

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Knovel - Product - Windows Internet Explorer

http://www.knovel.com/web/portal/main

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**Engineering Cases**

**Monitoring and Targeting With the Use of an Energy Management Information System in the Industrial Sector**  
by Pierre Langlois, P. Eng., CMVP, Econoler. Posted 3/11/2009

**Exhaust Waste Heat Recovery From Stationary Engines Using Organic Rankine Cycles**  
By Pedro J. Mago, Department of Mechanical Engineering, Mississippi State University. Posted on 3/2/2010

**New Delhi Mass Transport System: Metro Certified to EMS-ISO 14001 at Construction Stage**  
by Ushakiran Madari, Independent Consultant in Sustainability and Auditor of EMS-ISO 14001. Posted on February 24, 2010.

Welcome The Ohio State University Libraries

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Knovel - Profiles - Windows Internet Explorer

http://www.knovel.com/web/portal/profiles?p\_p\_id=EXT\_KNOVEL\_PROFILES&p\_p\_action=1&p\_p\_state=normal&p\_p\_mode=view&p\_col\_id=column-1&p\_p\_cc=

File Edit View Favorites Tools Help

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Knovel®

### Profile Registration

All fields with an asterisk (\*) are required. If you already have a profile, click [here](#).

Prefix: - Select One -

First Name:

Last Name:

Job Function: - Select One -

Discipline: - Select One -

\* E-mail:   
*(Please be sure your e-mail address is correct. You will receive an email with a link which you must click to complete registration.)*

\* Create Password:   
*(minimum of 6 characters, must include at least one letter and digit)*

\* Verify Password:   
*(retype password)*

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Knovel - Tutorial Videos - Mozilla Firefox

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### Tutorial Videos

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ZH 00:31 | 02:36



# Knovel: 搜尋更少. 瞭解更多

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U Z M R T U K J J P F J G U X L D C K V C B C Z M R T U K J J P F J G U X C K 9 J S U  
C U N T Y C Y H K I G X J K U H F H J B N N N U N T Y C G H K I G X J K U K S I C X C  
G T B Y O G M G N U H X K J S F J A V N X U X T B Y O G M G O U H X K J S Z G N N C G  
C H V U I C N F O Y J C K H L K N O W U K Y K H V U J C N F I Y J C K H L L D C K V C  
N A N I J N B D V T K V C G D C 9 W C M O R E A N I H N B D U T K V C G D S V B X B N  
X N K O H X V S E R L B B F B H I K J R K S K N K O S X V S Y R L B B F B H F H J N X  
K V I P J K C S L E T N X S V C N F K S S T S V I P E K C S T E T N X S V F J A V U K  
Z B U L X Z F E X A Y J F J H G S M B T G D G B U L A Z F J D A Y J F J H G D O H Y Z  
K G Y K J K G D C S U H J H D T F N H D D Y D G Y K R K G H S S U H J H D C 9 W C R K  
S A T M S S H R V G I G S 3 O K A B A Y V U V A T M C S H C X G I G G C O H I K J S S  
G E R N D G Y F B H O F D S A J S V O U F H F E R N H G L E S S O F J B O C N F K T G  
D Q D B I D J T N J I S R F S H F C W F J A J Q D B W D J V V J I S C V Q H C M B D D  
V U H V W V K Y U K U F N V D C A F K D D O D U H V H V K Y U N Y E H N U X B N H Y V  
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