

# Knovel

研究流程的最佳辅助利器

Knovel交互式工程数据分析数据库

飞资得信息技术

2012/11/14





## 内容

Knovel简介：为实务工作中的问题提供最佳答案

### 权威的内容、优化的检索以及数据分析工具

- 在此一章节我们将体验Knovel独特的三项重要功能

### 如何使用–内容浏览

- 以Knovel Critical Tables为例

### 如何使用–数据查询

- 在此一章节我们将学习到如何透过数据分析工具的查询来找到问题的答案

### 如何使用–基本检索

- 在此一章节我们将了解如何自超过2千种手册及参考工具书中发现答案。在说明中会强调如何整合文字于数字化的内容中。

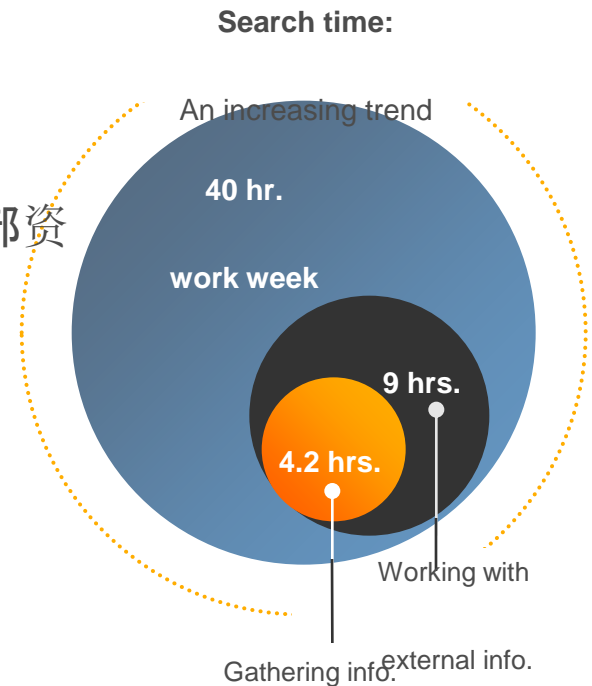
### 个人化的Knovel – myKNOVEL

- 在此一章节中我们将说明如何让个别的教授和学生可以在Knovel中建立自己的空间



# High Performance Culture: Engineers Knowledge

- 科学信息(Science information )每15-20年增加一倍\*
- 工程师所需的知识有83%是在毕业后才习得
- 工程师经常需要重新组织所获得的新知识\*\*
- 工程师每周花费25%的工作时间(约9小时)在处理外部资讯...在这个数字中,
  - 48%是花在收集资讯, . 而这个数字呈上升趋势 !
  - 每10个网络检索, 就有4个是失败的 (~38%)



\* Communication Patterns of Engineers, Tenopir, et al, IEEE 2004

\*\* Outsell



# Knovel协助教师达成帮助学生从实务问题中学习解决方案的目标

- **什么是Knovel?** Knovel数据库由Knovel公司开发，透过领先的技术提供数据深度挖掘的分析和检索工具，与工程、化工相关学科的整合信息与数据，为相关领域的学者、学生、和工程师提供值得信赖的答案并藉此创造出全新的解决方案
- Knovel同时关注**企业、政府、学术三界的工程学、化工社群动态**，并致力与其合作，希望成为工程师解决问题时的首选资源
- **历史:**
  - 在过去10年中，Knovel成功帮助全球知名机构的工程师，发挥创意执行节省成本的项目。
  - **高达9成的续订率**
- **使用Knovel的单位:**
  - 超过**700家技术独步全球的学术机构、研究机构及企业**使用Knovel，其中有**74家企业名列全球前500大企业**。
  - 超过**340家全球顶尖高校**采用Knovel辅助教学及研究，其中有**12家名列全美前15大工程学院**，**10家名列全球15强机械顶尖、航空航天、制造工程高校**。
  - 亚太地区使用Knovel的知名学术机构日益增加，包括新加坡南洋理工大学、澳洲雪梨大学、香港科技大学、韩国浦项科技大学以及中国的中国科学院、清华大学和浙江大学。
  - 工程学领域学会，包括ASME, AIChE, and ICHIME等前10大主要学会都与Knovel合作。

\*Based on the survey of 469 ASME and 285 AIChE members



# We have a distinguished customer list - the world's leading **BUSINESSES**

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

## Regionally

- Tsinghua University, China
- University of Sydney, Australia
- University of Hong Kong, China
- Hong Kong University of Science & Technology, China
- Nanyang Technological University, Singapore
- Hanyang University, Korea
- National Institute of Technologies, India

## Worldwide





We have a distinguished customer list - the world's leading **BUSINESSES**



GlaxoSmithKline







# Knovel的内容-来自于50多家国际顶尖出版社与学会组织

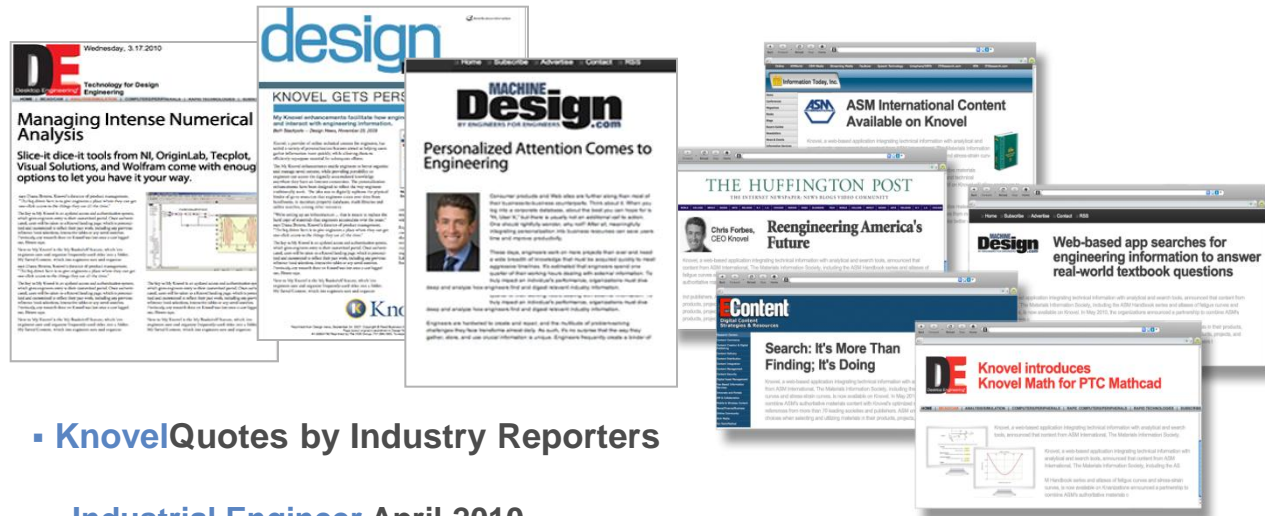
AASHTO美国州公路和运输官员协会	DECHEMA德国化工与生物技术学会	National Ground Water Association美国地下水协会
AIAA美国航天学会	FASEB美国实验生物学联合会	PMI国际项目管理学会
AIChE美国化学工程师学会	IFIS国际食品信息服务	RSC英国皇家化学学会
AMACOM美国管理协会	IABSE国际桥梁与结构工程协会	SAE International国际自动机工程学会
AOCS美国油脂化学学会	IChemE化学工程师学会	SIAM美国工业与应用数学学会
ASHRAE美国冷涑空调协会	IET国际工程技术学会	SME矿冶与探测学会
ASME美国机械工程学会	ISA国际自动化协会	SNAME美国造船暨轮机工程学会
ASM International美国材料信息学会	IOP英国物理学会	SPE国际塑料工程师学会
AEE美国能源工程师协会	TMS美国矿冶与材料学会	SVC美国真空镀膜协会
ASTM International美国材料试验协会	NACE International美国防蚀工程学会	SPIE国际光学工程学会
AWWA美国水行业协会	NCRP美国辐射防护与度量委员会	TRB美国运输研究委员会
		WEF水环境协会





# Knovel持续的努力在在线服务领域获得卓越的国际奖项

▪ Knovel is regularly featured in top engineering & content publications



▪ Knovel 2010 Awards



▪ Knovel Quotes 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不同于纸本书或电子书的特性

	Knovel	E Book Company	E book via Google	Print Book
所有的内容皆出自可信任的来源	✓			
内容专注于工程人员研究者的需求	✓			
整合文字检索与交互式内容	✓			
提供可互动的表格、图解和公式以获得更好的输出应用	✓			
在表格、图解和公式中搜寻数据—不仅文字	✓			
转换度量单位以搜寻更多相关结果	✓			
可以查询特定的数值或范围	✓			
在工程与材料主题中执行优化检索以获得具体的结果	✓			

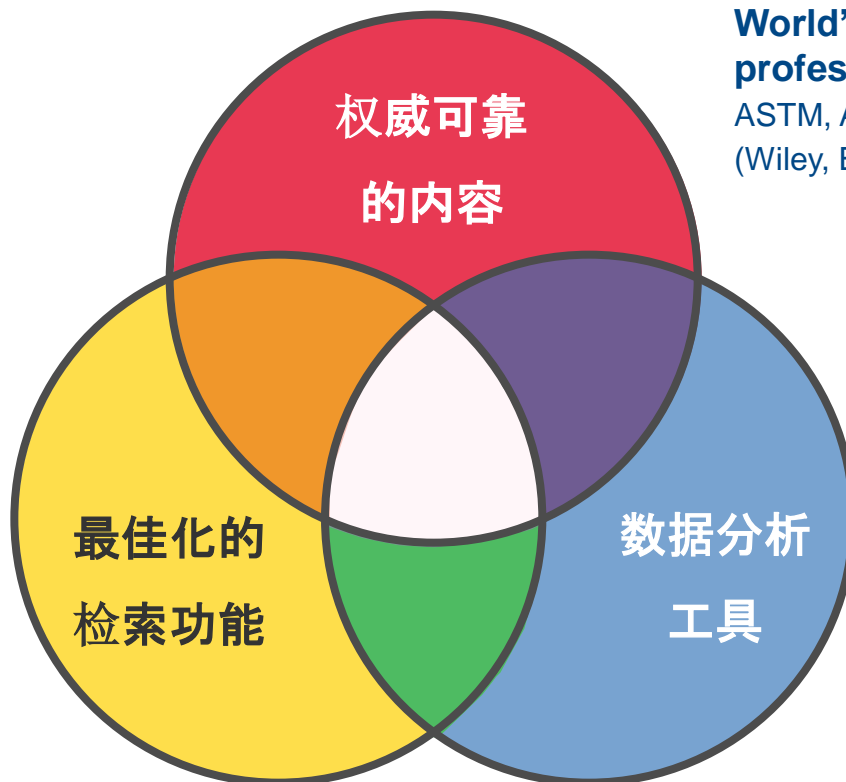


# KNOVEL helps engineers make informed decisions

透过领先的技术，提供数据深度挖掘的分析和检索工具，与工程、化工相关学科的整合信息与数据。

检索文字或数据

- Materials材料
- Chemical Substances化学物质
- Corrosion rate腐蚀速率
- Thermal Conductivity热传导率
- Stress Concentration应力集中
- Melting Point熔点
- Tensile Strength拉伸强度
- Fracture Toughness – 断裂韧性
- Adsorption Capacity吸附能力
- Boiling Point沸点
- Alloys合金



**World's leading engineering professional societies (ASME, ASHRA, ASTM, AICHE) and global publishers (Wiley, Elsevier)**

使用工作流程工具来分析结果

- 交互式图表、表格及方程
- 直接汇出至桌面
- 直接汇出至书目管理软件，例如 Endnote

What if? What is? How do I?



# KNOVEL delivers significant value

“KNOVEL is the missing link to complete my journey to becoming a superman.”

- Engineer at Top 5 Engineering Design Firm

## 专案设计&发展 Project Design & Development

- “材料选择，类型相似的设计，和公式或法则”
- “下水道的问题，基础建设，钢铁，公路，混凝土配合比设计”
- “蒸汽热负荷，蒸汽表，产品密度信息，HVAC计算等。”

## 过程改善 Process Improvement

- “过程信息，优势表格，公式”
- “石油和天然气的过程，化学过程”
- “这个提供一站式的多种类型数据，我不需浪费时间联系制造商或上网进行搜索”

## 安全 & 制度遵守 Safety & Compliance

- “石油和天然气设施相关的技术设计。监督管理和环境方面的考虑。监督管理和环境方面的考虑。”
- “准备测试和认证”
- “建设规划和管理，调度，项目控制，施工性研究”



# Validated Content from Major Publishers & Societies



## 权威可靠的内容

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



AICHE



PennWell®

IOP



Over the past 12 months the engineers of ONE major aerospace company accessed **64,000 chapters** via Knovel



收录在超过25个工程学领域的可被信任的权威内容

- ⊕ Adhesives, Coatings, Sealants & Inks
- ⊕ Aerospace & Radar Technology
- ⊕ Biochemistry, Biology & Biotechnology
- ⊕ Ceramics & Ceramic Engineering
- ⊕ Chemistry & Chemical Engineering
- ⊕ Civil Engineering & Construction Materials
- ⊕ Computer Hardware Engineering
- ⊕ Earth Sciences
- ⊕ Electrical & Power Engineering
- ⊕ Electronics & Semiconductors
- ⊕ Environment & Environmental Engineering
- ⊕ Food Science
- ⊕ General Engineering & Engineering Management
- ⊕ Industrial Engineering & Operations Management
- ⊕ Mechanics & Mechanical Engineering
- ⊕ Metals & Metallurgy
- ⊕ Mining Engineering & Extractive Metallurgy
- ⊕ Nanotechnology
- ⊕ Oil & Gas Engineering
- ⊕ Optics & Photonics
- ⊕ Pharmaceuticals, Cosmetics & Toiletries
- ⊕ Plastics & Rubber
- ⊕ Process Design, Control & Automation
- ⊕ Safety & Industrial Hygiene
- ⊕ Sustainable Energy & Development
- ⊕ Textiles
- ⊕ Transportation Engineering
- ⊕ Welding Engineering & Materials Joining





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## 为工程师设计的最佳化搜寻

- 搜寻隐藏在表格、图和公式中的数据资料
- “了解”工程师的语言
- 提供数值或数值范围的搜寻
- 自动化的度量单位转换
- 可以执行多个栏位的查询





直接从内容页(content page)中  
使用超过95,000个已数字化的交互  
式表格、图与方程式



搜寻数据数据：  
在超过95,000个已数字化的表格、图与  
公式中搜寻



搜寻文字：  
整合搜寻超过2,000种的手册、参  
考书以及95,000个相关的数字化  
表格、图解和公式



# 将数据分析工具整合在工程师的工作流程中

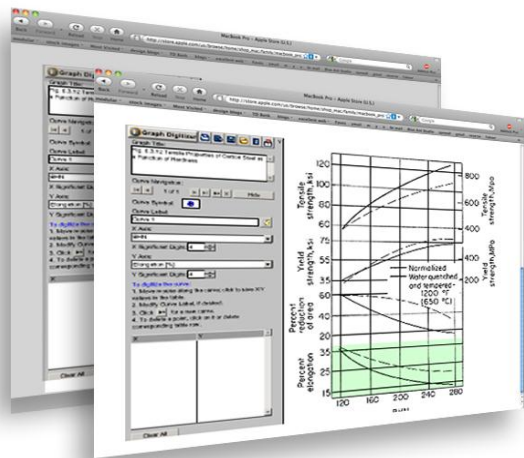


## Validated Content

- 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

## 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



## 将数据分析工具 整合在工程师的工作流程中

- 简单的工具可做初步的计算与信息的整合
- 超过95,000种互动表格、图和公式
- 可以客制化并操作数据呈现方式, 同时可以轻松的工作表中排序
- 可以直接在图表中绘制一个或多个数据点和曲线
- 可以导出数据到指定的格式(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**

显示已有数字化的表格、图和公式























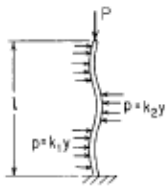
- **Chemical Properties Handbook**  
- **Chemical Reaction Engineering (3rd Edition)**  
- **Chemistry of the Elements (2nd Edition)** 
- **DIPPR 882 - Transport Properties and Related Thermodynamic Data of Binary Mixtures, Parts 1-4** 
- **DIPPR Project 801 - Full Version**   
- **Dean's Analytical 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**   



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

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

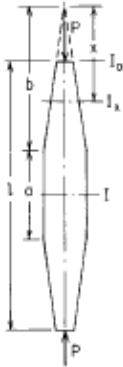


$$P' = \frac{\pi^2 EI}{l^2} \left( m^2 + \frac{k_2 l^4}{m^2 \pi^4 EI} \right)$$

m	$\alpha$
1	1
2	$1 + \phi(0.23 - 0.0$
3	$0.75 - 0.56\phi$

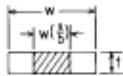
This is an empirical expression carried out for values of

6. Straight bar, middle portion uniform, end portions tapered and alike; end load;  $I$  = moment of inertia of cross section of middle portion;  $I_0$  = moment of inertia of end cross sections;  $I_x$  = moment of inertia of section  $x$



(For singly tapered columns see Ref. 46.)

6a.  $I_x = I \frac{x}{b}$   
for example, rectangular section tapering uniformly in width



6b.  $I_x = I \left( \frac{x}{b} \right)^2$   
for example, section of slender members lapped together



EquationSolver 9 - Microsoft Internet Explorer

Equation Solver

Equation:

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

Input Values to Calculate P':

Symbol	Value	Unit (click to change)
E	10	ksi
I	1.234	lb in <sup>2</sup>
l	10	in
k1	1	lb/in
k2	1	lb/in

P': Critical Load

P' Significant Digits: 4

P' = 0.1525 lbf

Calculate

Display Plotting Controls

Select Variable and Plot P':

Variable	Definition
pi	Circumference-diameter ratio of a circle
E	Modulus of Elasticity
I	Moment of Inertia
l	Length
k1	Later Force per Unit Length of Deflection Toward Soft

l Min.: 1.000 in

l Max.: 10.00 in

l 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	6.289
2.061	3.589
3.069	1.619
4.563	0.7323

Plot Add Point Clear All

Zoom: 100%

l Axis:  Linear  Log

P' Axis:  Linear  Log

Show:  Grid Lines

Critical Load vs. Length





# 数据分析工具-互动表格

Table 1A 2004 SECTION II

INTERACTIVE TABLE				
TABLE 1A				
SECTION I: SECTION III, CLASS 2 AND 3; SECTION VII				
MAXIMUM ALLOWABLE STRESS VALUES SFO				
(*See Maximum Temperature Limits For Re				
Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade
1	Carbon steel	Sheet	SA-1008	CS-A
2	Carbon steel	Sheet	SA-1008	CS-B
3	Carbon steel	Bar	SA-675	A5
4	Carbon steel	Wld. pipe	SA-134	A203A
5	Carbon steel	Plate	SA-263	A
6	Carbon steel	Plate	SA-265	A
7	Carbon steel	Wld. pipe	SA-672	A40
8	Carbon steel	Sheet	SA-414	A
9	Carbon steel	Wld. tube	SA-170	A
10	Carbon steel	Wld. tube	SA-170	A
11	Carbon steel	Smis. tube	SA-179	...
12	Carbon steel	Smis. tube	SA-192	...
13	Carbon steel	Wld. tube	SA-214	...
14	Carbon steel	Smis. tube	SA-556	A2
15	Carbon steel	Wld. tube	SA-557	A2
16	Carbon steel	Wld. pipe	SA-53	E/A
17	Carbon steel	Wld. pipe	SA-53	E/A
18	Carbon steel	Wld. pipe	SA-53	E/A
19	Carbon steel	Wld. pipe	SA-53	F
20	Carbon steel	Smis. pipe	SA-53	S/A
21	Carbon steel	Smis. pipe	SA-53	S/A
22	Carbon steel	Smis. pipe	SA-106	A
23	Carbon steel	Wld. pipe	SA-135	A
24	Carbon steel	Finged pipe	SA-369	FPA
25	Carbon steel	Wld. pipe	SA-567	...
26	Carbon steel	Wld. pipe	SA-567	...
27	Carbon steel	Bar	SA-675	50
28	Carbon steel	Bar	SA-675	50
29	Carbon steel	Wld. pipe	SA-134	A203B
30	Carbon steel	Plate	SA-263	B
31	Carbon steel	Plate	SA-265	B
32	Carbon steel	Plate	SA-265	B
33	Carbon steel	Wld. pipe	SA-672	A30
34	Carbon steel	Sheet	SA-414	B
35	Carbon steel	Plate	SA/EN 10028-3	P225/NH
36	Carbon steel	Bar	SA-675	55
37	Carbon steel	Bar	SA-675	55

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
A-α-C		C <sub>11</sub> H <sub>9</sub> N <sub>3</sub>	183.21	26148-88-5			202			
abietic acid		C <sub>20</sub> H <sub>30</sub> O <sub>2</sub>	302.46	514-10-3		208-178-3 (technical)	172-175 (monoclinic plates from alcohol plus water), commercial abietic acid may be glassy or partly crystalline and may melt as low as 85			
acenaphthene		C <sub>12</sub> H <sub>10</sub>	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
acenaphthylene		C <sub>12</sub> H <sub>8</sub>	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
acephate		C <sub>4</sub> H <sub>10</sub> NO <sub>3</sub> PS	183.17	30560-19-1	TB 4760000	250-241-2	88-90; 82-93 (technical grade)			1.35 (temperature unspecified)
acetal	CH <sub>3</sub> CH(OCH <sub>2</sub> CH <sub>3</sub> ) <sub>2</sub>	C <sub>8</sub> H <sub>14</sub> O <sub>2</sub>	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
acetaldehyde	CH <sub>3</sub> CHO	C <sub>2</sub> H <sub>4</sub> O	44.05	75-07-0	AB 1925000	200-836-8	-123.5	20.2	-27	0.783 at 20°C
acetaldehyde formylmethylhydrazone	H <sub>3</sub> CCH=NNCH <sub>3</sub> CHO	C <sub>4</sub> H <sub>8</sub> N <sub>2</sub> O	100.12	16568-02-8	LQ 8500000		5			
acetaldoxime	CH <sub>3</sub> CH=NOH	C <sub>2</sub> H <sub>5</sub> NO	59.07	107-29-9	AB 2975000	203-479-6	47	115		



# 数据分析工具公式的套用- EXCEL

2.1. Source Models [Click to View Calculation Example](#) 83

**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
TOTAL:	1.5

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

Exit velocity:	5.7 m/s
Mass flow:	0.22 kg/s

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

File Edit View Favorites Tools Help

A31 f<sub>x</sub>

	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	TOTAL:			1.5					
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	Exit velocity:			5.7	m/s				
26	Mass flow:			0.22	kg/s				
27									
28									
29									

EX2-1



# 数据分析工具数字化的图表

3-48 MECHANICS OF FLUIDS

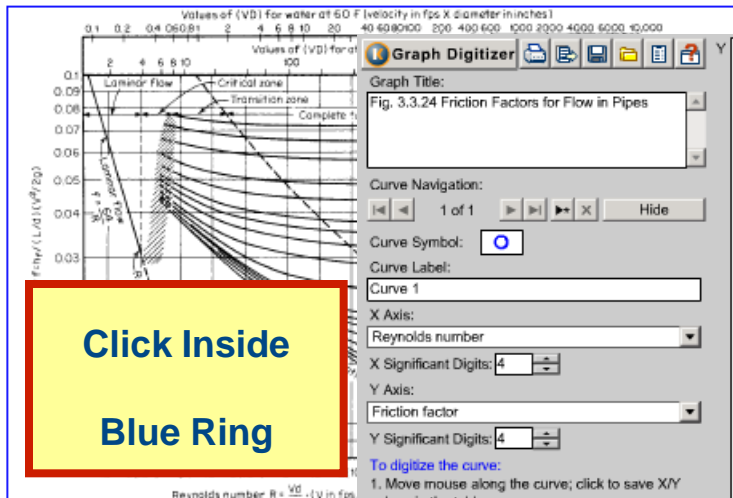


Fig. 3.3.24 Friction factors for flow in pipes.

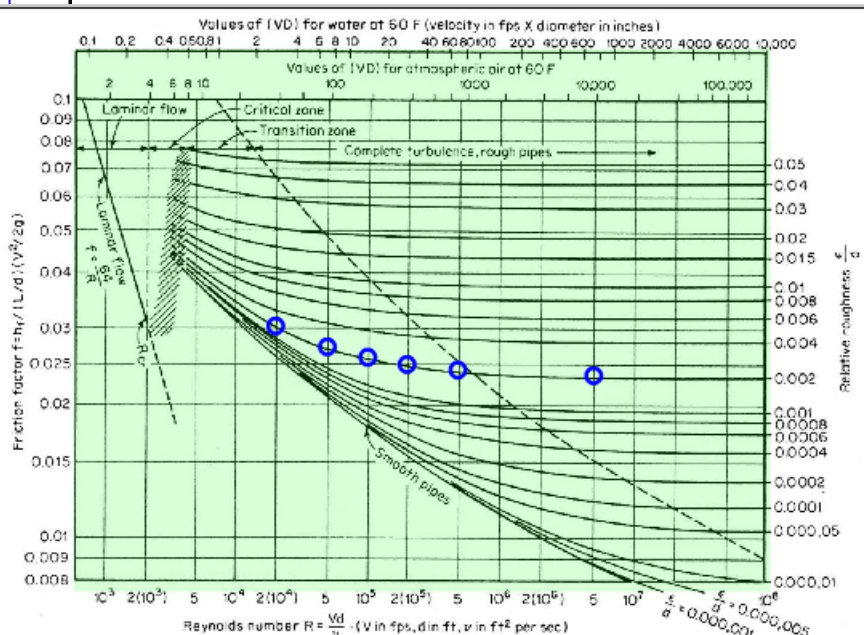
can be maintained with care to very low Reynolds numbers, but the slightest upset will result in laminar flow if the Reynolds number is less than 2,000. The Reynolds-number range between 2,000 and 4,000 is called the critical zone (Fig. 3.3.24). Flow in this zone is unstable, and designers of piping systems must take this into account.

**Example 3.3.2** Glycerin at 68°F (20°C) flows through a horizontal pipe 1 in in diameter and 20 ft long at a rate of 0.003 lbm/s. What is the pressure loss? From the continuity equation  $Q = VA = (\pi/4)(1/12)^2 \times 32.174 \times 0.003 = 0.0006$  ft<sup>3</sup>/s. The Reynolds number  $R = \rho V D / \mu = (1.26 \times 10^{-12}) / (0.0006 / 32.174) = 6.8 \times 10^{-5}$ . The Reynolds number  $R < 2,000$ , therefore, flow is laminar and  $f = 64/R = 64 / (6.8 \times 10^{-5}) = 9.41 \times 10^5$ .  $\Delta p = f L Q / A^3 = 9.41 \times 10^5 \times 20 \times 0.0006 / (\pi/4 \times (1/12)^2)^3 = 3.957$  lb/ft<sup>2</sup> (2.728 × 10<sup>4</sup> N/m<sup>2</sup>).

**Turbulent Flow** The friction factor for Reynolds number over 4,000 is computed using the Colebrook equation:

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

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  $(\epsilon/D)/3.7$  is small compared with  $2.51/R\sqrt{f}$ . On the other hand, as the Reynolds number increases so that  $2.51/R\sqrt{f} \rightarrow 0$ , 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. 3.3.24 exposing the surface roughness to flow. Values of absolute roughness  $\epsilon$  are given in Table 3.3.1. The variation



To drag the image or a point press the Ctrl key, click on the object, and then release the Ctrl key. Show:  Active Area X

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.



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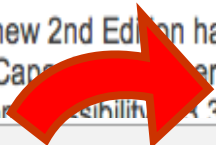
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Fundamental Physical Constants

• Common Isotopic Compositions

Calculated Properties of Common Organic Compounds

Table (350)



## 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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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	<i>trans</i> -1,2-Dichloroethylene	0.423 @ 15°C	Sort Ascending Sort Descending Columns	0.7 @ 25°C; benzene	25 @ 20°C	
408	Dichloromethane	0.449 @ 15°C		1.6, gas	30.41	0.1284
458	Diethyl sulfide	0.446 @ 20°C		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

Dean's Handbook of Organic Chemistry (2nd Edition)  
© 2004 McGraw-Hill



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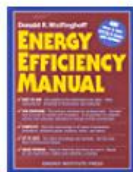
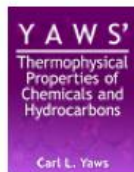
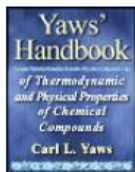
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The dynamics of process operations are often overlooked in the undergraduate chemical engineering curriculum. In addition, they are often overlooked or inadequately considered in process design and preparation of operating procedures for new facilities. These dynamics are important considerations for:

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- Considerations of upset conditions
- Operation of batch [...]

#### Computer Simulation Risks

By Joe M. Bonem. Posted 6/13/2012.

#### Shale Gas: The Facts About Chemical Additives

by Dr. Henry Craddock. Posted 5/22/2012.

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Operator

tensile yield strength

exists

And Or Not

Field

Operator

Value

all text fields

is (=)

fracture

Add another row

- |   |  |  |
|---|--|--|
| <b>keyword</b><br>all text fields   | <b>ion exchange properties</b><br>dry exchange capacity<br>exchange swelling<br>wet exchange capacity  | <b>solution properties</b><br>acid dissociation constant, pK<br>acid number<br>log activated carbon partition coefficient<br>aniline point<br>azeotropic temperature<br>cation-exchange capacity<br>cation exchange capacity (vol)<br>cloud point<br>concentration (equiv/m)<br>concentration (g equiv/vol)<br>concentration (mass/mass basis)<br>concentration (mass/vol) |
| <b>acid-base properties</b><br>acceptor number<br>donor number  | <b>magnetic properties</b><br>coercivity<br>core loss<br>frequency<br>magnetostriction constant<br>magnetic flux density<br>magnetic force<br>Schmidt number |  |
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- Table 12b. Representative Fracture Parameters for Wrought and Cast Aluminum Alloys (Metric Units)

#### Relevancy

100 %

#### Content Type

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[Table](#) (110)

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100 %

**Standard Handbook of Machine Design (3rd Edition)**

99 %

**ASM Handbook, Volume 20 - Materials Selection and Design**

99 %

**ASM Handbook, Volume 01 - Properties and Selection: Irons, Steels, and High-Performance Alloys**

99 %

**Magnesium Alloy Database**

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### Table 12a. Representative Fracture Parameters for Wrought and Cast Aluminum...

**Table:** Table 12a. Representative Fracture Parameters for Wrought and Cast Aluminum Alloys (US Customary Units)

**Table Type:** Interactive Table

**Search Query:** (tensile yield strength EXISTS) and (fracture)

**Total Number of Search Hits:** 112

**Total Number of Rows:** 113

Pages: <<< 1 2 3 >>>

Jump to: 1 of 3

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Table 12a. Representative Fracture Parameters for Wrought and Cast Aluminum Alloys (US Customary Units)										
no.	alloy type	product type	alloy name	UNS no.	temper	tensile yield stre... (ksi)	unit propagation... (lbf in/in <sup>2</sup> )	plane strain frac... (ksi in <sup>1/2</sup> )	plane strain frac... (ksi in <sup>1/2</sup> )	relative crit. crac... (in)
1	Aluminum Alloy ...	premium streng...	224.0	A02240	T7	41.4	~200	30.2	30	0.73
2	Aluminum Alloy ...	sand castings	240.0	A02400	F	26	~75		16	0.62
3	Aluminum Alloy ...	sand castings	242.0	A02420	F	20.4	~120		21	1.03
4	Aluminum Alloy ...	premium streng...	249.0	A02490	T7	49.2	~200	29.7	30	0.6
5	Aluminum Alloy ...	sand castings	295.0	A02950	T6	27.1	~250		>35	>1.67
6	Aluminum Alloy ...	sand castings	308.0	A03080	F	18.5	~250		19	1.03
7	Aluminum Alloy ...	permanent mol...	354.0	A03540	T62	44.9	128		22	0.49
8	Aluminum Alloy ...	premium streng...	354.0	A03540	T6	43	~125	18	18	0.42
9	Aluminum Alloy ...	permanent mol...	356.0	A03560	T7	22	168		30	1.36



查询某一特性的互动表格数据  
例：与Failure Strength相关的互动表格

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And  Or  Not

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<input type="text" value="graph index"/>	<input type="text" value="exists"/>	<input type="button" value="+ Add another row"/>

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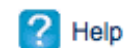


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# Searching for Numeric & Tabular Data

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例：钢材在柠檬酸的腐蚀速度Rate of Corrosion

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<input type="text" value="material or substance name"/>	<input type="text" value="is (=)"/>	<input type="text" value="steel"/>

And  Or  Not

Field	Operator	Value	Units
<input type="text" value="corrosion rate"/>	<input type="text" value="less than or equal to (&lt;=)"/>	<input type="text" value="20"/>	<input type="text" value="mpy"/>
-1.34 - 105000.0 mpy			

And  Or  Not

Field	Operator	Value
<input type="text" value="exposure medium"/>	<input type="text" value="is (=)"/>	<input type="text" value="citric acid"/>

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查询某材料某一特性的数据  
例: 2219合金的导热率 Thermal Conductivity

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		201.0 - 52100.0

And  Or  Not

Field	Operator	
<input type="text" value="thermal conductivity"/>	<input type="text" value="exists"/>	<input type="button" value="+ Add another row"/>

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# Data Search

# Searching for Numeric & Tabular Data

查询某材料某一特性的数据  
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<input checked="" type="radio"/> And <input type="radio"/> Or <input type="radio"/> Not			
<input type="text" value="tensile strength"/>	<input type="text" value="is between (&gt;=&lt;=)"/>	<input type="text" value="15000"/> and <input type="text" value="25000"/>	<input type="text" value="psi"/>
		<b>2.99 - 3.23E11 psi</b>	<input type="button" value="+ Add another row"/>

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### 问题

某工程师正研发一款清洗生产过程中使用的各式容器的改良洗洁液, 该工程师知道具有高表面张力和低黏度的溶液可制造出较好的清洗剂。他找寻具有下列特性的所有溶液来制作洗洁剂:

- 表面张力  $\geq 25$  milliNewtons per metre
- 动力粘度  $\leq 0.5$  milliPascal per second

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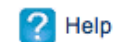


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### combustion properties

rate of pressure rise

### electrical properties

surface resistance

surface resistivity

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explosion pressure

exposure limit (w/v)

exposure limit

### optical properties

band gap pressure

coefficient

### physical constants

critical pressure

triple point pressure

vapor pressure

surface area

### processing properties

### surface properties

specific surface area

surface tension

surface area (vol basis)

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allowed working pressure

exposure medium

exposure strain

exposure medium class

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surface tension

- is (=)
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- ✓ greater than or equal to ( $\geq$ )
- is between ( $> / < =$ )

Value

-67.4 - 7000.0 mN/m

Units

mN/m

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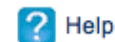


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Field

surface tension

Operator

greater than or equal to

Value

25

-67.4 - 7000.0 mN/m

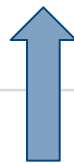
Units

- ✓ mN/m
- dyne/cm
- lbf/ft
- N/m
- erg/cm<sup>2</sup>
- gf/cm
- J/m<sup>2</sup>
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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" value="Add another row"/>

or [clear form](#)





# 输入新的检索数据与数值后执行查询



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## Data Search

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Help

Field	Operator	Value	Units
<input type="text" value="surface tension"/>	greater than or equal to	25	mN/m
-67.4 - 7000.0 mN/m			

And  Or  Not

Field	Operator	Value	Units
<input type="text" value="dynamic viscosity"/>	less than or equal to (<=)	0.5	mPa s
-7.51E-10 - 1.5E16 mPa s			

Add another row

Search or clear form



检索结果显示在最前面两本书并标示出来



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

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Titles:

Relevancy

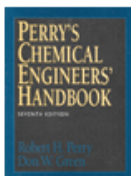
Knovel Solvents - A Properties Database 100 %



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Sections	Relevancy	Content Type
Physical Properties	100 %	Table (18)

Perry's Chemical Engineers' Handbook (7th Edition) 100 %



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Sections	Relevancy	Content Type
Table 2-352 Saturated Water Substance-Temperature (SI units)	100 %	Table (39)



Heat Transfer Handbook 99 %

Pumping Station Design (Revised 3rd Edition) 98 %

Mechanical Engineers' Handbook - Energy and Power (3rd Edition) 97 %

2009 ASHRAE Handbook - Fundamentals (I-P Edition) 97 %



检索的条件会以蓝色标示出来，所有的字段都可以排序和移动

Table 2-352 Saturated Water Substance-Temperature (SI units)

**Table:** Table 2-352 Saturated Water Substance-Temperature (SI units)

**Table Type:** Interactive Table

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

**Total Number of Search Hits:** 39

**Total Number of Rows:** 71

**Pages:**

**Jump to:** 1 of 1

**Display:** Data Found | All Data

Table 2-352 Saturated Water Substance-Temperature (SI units)							
no.	temp. (K)	pressure (bar)	volume, liq. (m <sup>3</sup> /kg)	volume, gas (m <sup>3</sup> /kg)	viscosity, liq. (Pa s)	surface tension, ... (N/m)	enthalpy of fusio... (kJ/kg)
17	273.15	0.00611	1.000 × 10 <sup>-3</sup>		1750 × 10 <sup>-6</sup>	0.0755	0.0
18	275	0.00697	1.000 × 10 <sup>-3</sup>		1652 × 10 <sup>-6</sup>	0.0753	7.8
19	280	0.00990	1.000 × 10 <sup>-3</sup>	130.4	1422 × 10 <sup>-6</sup>	0.0748	28.8
20	285	0.01387	1.000 × 10 <sup>-3</sup>	99.4	1225 × 10 <sup>-6</sup>	0.0743	49.8
21	290	0.01917	1.001 × 10 <sup>-3</sup>	69.7	1080 × 10 <sup>-6</sup>	0.0737	70.7
22	295	0.02617	1.002 × 10 <sup>-3</sup>	51.94	959 × 10 <sup>-6</sup>	0.0727	91.6



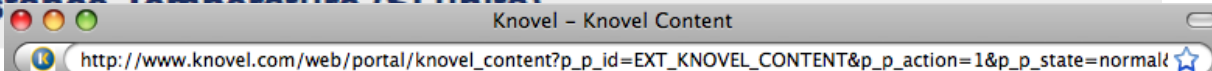
检索结果可以汇出以提供脱机浏览



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### Table 2-352 Saturated Water Substance Temperature (SI units)

**Table:** Table 2-352 Saturated Water Substance-Temperature  
**Table Type:** Interactive Table  
**Search Query:** (surface tension >= 25 mN/m) and (density >= 1000 kg/m<sup>3</sup>)  
**Total Number of Search Hits:** 39  
**Total Number of Rows:** 71



Knovel: Export Table

#### Select an Export Option:

- Current page of table (up to 50 rows)
- 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**

no.	temp. (K)	pressure (bar)	density (kg/m <sup>3</sup> )	viscosity (Pa·s)	surface tension (N/m)	heat capacity (kJ/kg·K)	latent heat (kJ/kg)
17	273.15	0.00611					
18	275	0.00697					
19	280	0.00990					
20	285	0.01387	1.000 × 10 <sup>-3</sup>	99.4	1225 × 10 <sup>-6</sup>	0.0743	49.8
21	290	0.01917	1.001 × 10 <sup>-3</sup>	69.7	1080 × 10 <sup>-6</sup>	0.0737	70.7
22	295	0.02617	1.002 × 10 <sup>-3</sup>	51.94	959 × 10 <sup>-6</sup>	0.0727	91.6



# 选择文件类型(FILETYPE)



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## Table 2-352 Saturated Water Substance-Temperature (SI units)

**Table:** Table 2-352 Saturated Water Substance-Temperature  
**Table Type:** Interactive Table  
**Search Query:** (*surface tension* >= 25 mN/m) and (*d*)  
**Total Number of Search Hits:** 39  
**Total Number of Rows:** 71

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**Knovel: Export Table**

### Select a File Type:

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- HTML
- PDF
- Text (tab-delimited)

**BACK** **EXPORT** **CLOSE** **HELP**

Done

no.	temp. (K)	pressure (bar)					
17	273.15	0.00611					
18	275	0.00697					
19	280	0.00990					
20	285	0.01387	$1.000 \times 10^{-3}$	99.4	$1225 \times 10^{-6}$	0.0743	49.8
21	290	0.01917	$1.001 \times 10^{-3}$	69.7	$1080 \times 10^{-6}$	0.0737	70.7
22	295	0.02617	$1.002 \times 10^{-3}$	51.94	$959 \times 10^{-6}$	0.0727	91.6





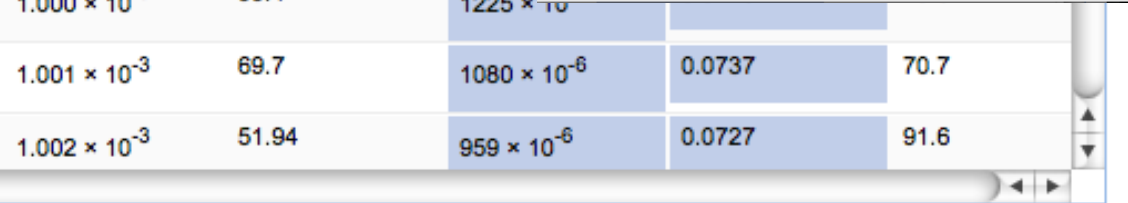
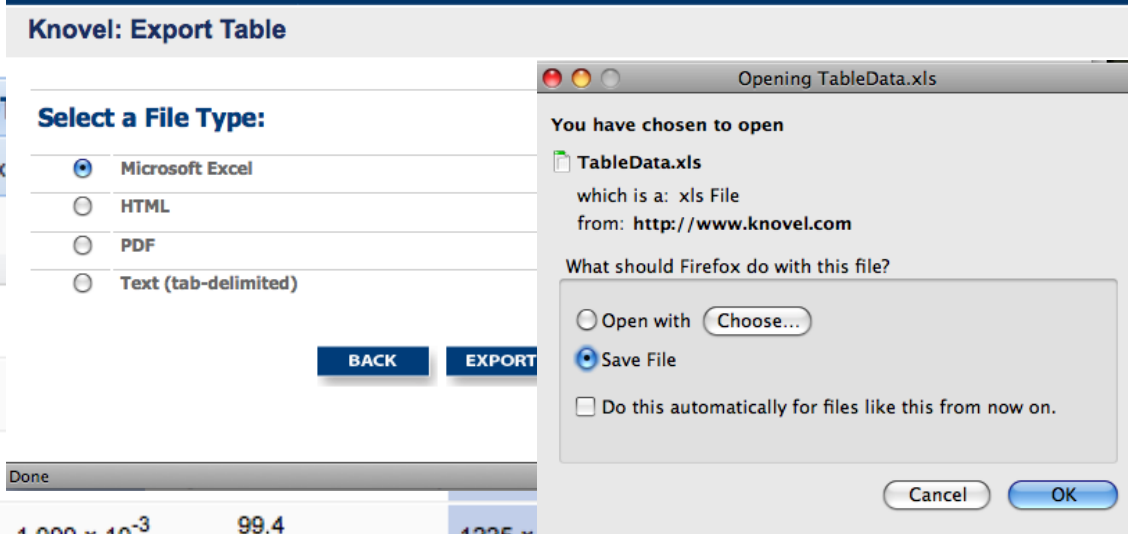
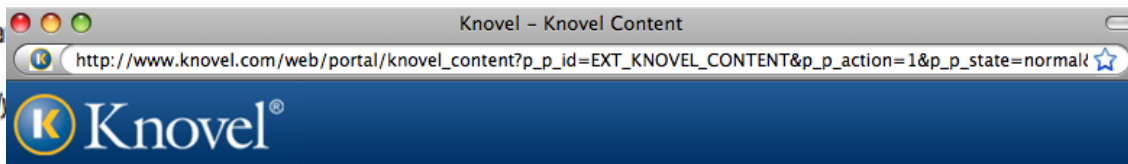
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### Table 2-352 Saturated Water Substance-Temperature (SI units)

**Table:** Table 2-352 Saturated Water Substance-Temperature  
**Table Type:** Interactive Table  
**Search Query:** (*surface tension* >= 25 mN/m) and (*d*)  
**Total Number of Search Hits:** 39  
**Total Number of Rows:** 71



no.	temp. (K)	pressure (bar)
17	273.15	0.00611
18	275	0.00697
19	280	0.00990
20	285	0.01387
21	290	0.01917
22	295	0.02617



现在检索结果已经储存在个人计算机里供后续分析应用

**Title: Dean's Handbook of Organic Chemistry (2nd Edition)**  
**Table: Interactive Table 4.10 Viscosity, Dielectric Constant, Dipole Moment, and Surface Tension of Selected Organic Substances**

no.	material	viscosity (cP)	dielectric constant	dipole moment (D)	surface tension (dyne/cm)	surface tension coefficient (dyne/cm <sup>2</sup> )
14	Acetone, liq	0.391 @ 0°	20.7 @ 25°	2.77 @ 20°	26.26	0.112
18	Acetonitrile	0.397 @ 10	37.5 @ 20°	3.97, gas	29.58	0.1178
30	Acrylonitrile	0.35 @ 20°	33 @ 20°C	3.91, gas	29.58	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-Butanethiol	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 @ 15	9.07 @ -30	2.13, gas	25.97	0.1117
288	3-Chloro-1-butanol	0.347 @ 15	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 @ 25	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 @ 15	2.14 @ 25°	0.7 @ 25°C	25 @ 20°C	
408	Dichloromethane	0.449 @ 15	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 @ 15	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	Ethanesithiol	0.00316, gas	6.9 @ 15°C	1.57, gas	25.06	0.0793
614	Ethyl acetate	0.473 @ 15	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 @ 15	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 @ 25	13.3, mixed isomers	2.7 @ 30°C	29.07	0.069, mixed isomers



# 数据后续的加值与应用

## Title: Knovel Solvents - A Properties Database

### Table: Physical Properties

no.	name	IUPAC Name	CAS Registry no.	molecular weight	freezing temperature (°C)	boiling temperature (°C)	evaporatio	color	dielectric constant	surface tension (mN/m)	viscosity (cP)
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



### 问题

一个香水调香师正设计一款新的香水配方，希望能找到一种共溶剂(可能是醇)，以确认所有的成分都能充分混合且液体为透明的。他在考虑寻找醇类拥有

- 沸点介于摄氏100-200度
- 熔点介于摄氏50-100度

### 方案

- 使用Knovel的data search工具找出具有此特性的所有材料



## Search Example: 找寻答案的检索方式如下

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Field	Operator	Value	Units
<input type="text" value="melting point"/>	is between (>= / <=)	50 and 100	°C
-272.0 - 10500.0 °C			

And  Or  Not

Field	Operator	Value	Units
<input type="text" value="boiling point"/>	is between (>= / <=)	100 and 200	°C
-273.0 - 215000.0 °C			

And  Or  Not

Field	Operator	Value
<input type="text" value="material or substance name"/>	is (=)	alcohol

选择材料名称

Search

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**Basic Search/  
Case Study**





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Sections	Relevancy	Content Type
10.3.2.2 Gas Turbine with Sequential Combustion	100 %	Text
3.2.2.8 Steam Turbine Basic Components and Main Systems	100 %	Text
4.3.5.1 Energy Transfer from Gas Flow to Turbine	100 %	Text
5.2.4.1 Characteristics of Turbine Oil and Applications	100 %	Text
17.2.4.2 Aircraft Gas Turbine Engine Experiment	97 %	Text

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**Gas Turbine Engineering Handbook (3rd Edition)** 100 %

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Sections	Relevancy	Content Type
22.3 Axial-Flow Turbines	100 %	Text
Interactive Graphs	81 %	Table (19)

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Protective Coatings for Turbine Blades	91 %



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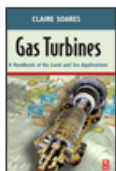
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Gas Turbines - A Handbook of Air, Land, and Sea Applications

Search Within

By: Soares, Claire © 2008 Elsevier

Description: This book offers professional engineers and technicians hard-to-find manufacturer's data with extensive interpretation and explanation.

Table of Contents

- Title Details Citation + My Knovel

Table with 3 columns: Sections, Relevancy, Content Results. Lists various turbine sections and their relevancy percentages.



### 问题

一个石油工程师要设计一个横跨整个厂房来运输天然气的管路。厂方提供要求如下：

- 运输管路将长达10英哩
- 运输管路的内部直径为6.1英吋

### 方案

- 使用Knovel来看解决方案



## 检索 natural gas flow

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By Amanda D. Smith and Dr Pedro J. Mago. Posted 1/31/2012.

**Reactor Scale-Up of Copper-Chlorine Cycle of Hydrogen Production from Proof of Principle to Large Engineering Scale**  
By G. F. Naterer and Z. Wang. Posted 01/11/2012.

**IE+D Leverages Lean Principles to Differentiate Engineering Services**  
by Ray Minato, President, Inertia Engineering + Design Inc. (IE+D). Posted 01/02/2012.

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22.22 Heat Value Conversions and Natural Gas Equivalents of Various Fuel Units	100 %  Text
9.1.3 Categories of Natural Gas and Reserves Terminology	100 %  Text
10.1.3 Estimate hp Required to Compress Natural Gas	97 %  Text
11.13 Estimate Pipe Size Requirements for Increasing Throughput Volumes of Natural Gas	97 %  Text
<a href="#">Show more results</a>	

**Advanced Petroleum Reservoir Simulation** 95 %



## 增加检索 **natural gas flow and pipeline**



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<b>Sections</b>	<b>Relevancy</b>	<b>Content Type</b>
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22.22 Heat Value Conversions and Natural Gas Equivalents of Various Fuel Units	100 %	Text
9.1.3 Categories of Natural Gas and Reserves Terminology	100 %	Text
10.1.3 Estimate hp Required to Compress Natural Gas	97 %	Text
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Ludwiga's Applied Process Design for Chemical Petrochemical Plants. Volume 1 (4th Edition)	90 %



最相关的结果为 **Section 11.2.1 – Sizing Pipelines**

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 options like 'Home', 'My Knovel', 'Browse', 'Data Search', 'Tools', 'Support', 'Live Chat', and 'About Us'. The main content area displays the search results for 'natural gas flow and pipeline'. The top result is 'Natural Gas Engineering Handbook' by Guo, Boyun; Ghalambor, Ali © 2005 Gulf Publishing Company. A description of the book is provided. Below the description is a table with columns for 'Sections', 'Relevancy', and 'Contents'. The row for '11.2.1 Sizing Pipelines' is highlighted with a red box, and a red arrow points to it from the right. Other rows include '8.2.1 Water Content of Natural Gas Streams', '9. Compression and Cooling', and '9.1 Introduction'.

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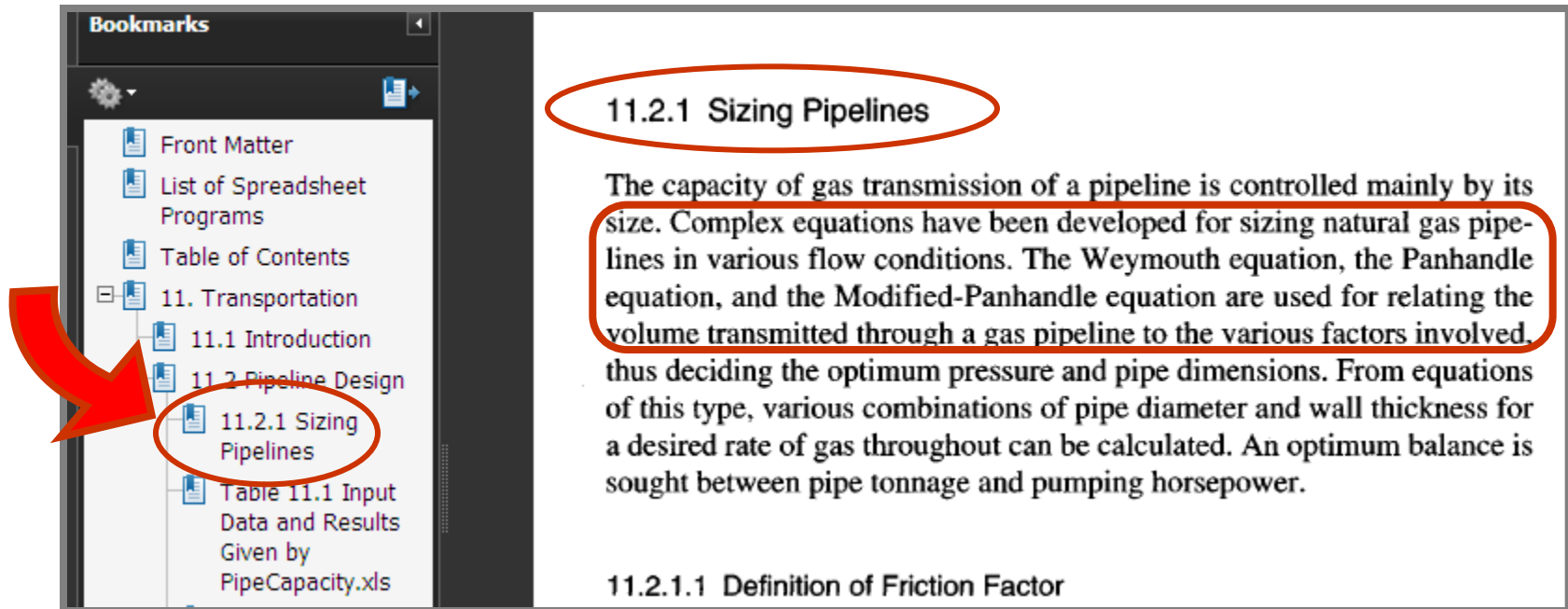
You searched for (natural gas flow and pipeline)

**Natural Gas Engineering Handbook** Search Within

By: Guo, Boyun; Ghalambor, Ali © 2005 Gulf Publishing Company

**Description:** This book covers the full scope of natural gas engineering, from gas reservoir engineering to gas production to gas processing. It adapts a computer-assisted approach, which is current practice in the industry and severely lacking in other books on natural gas engineering.

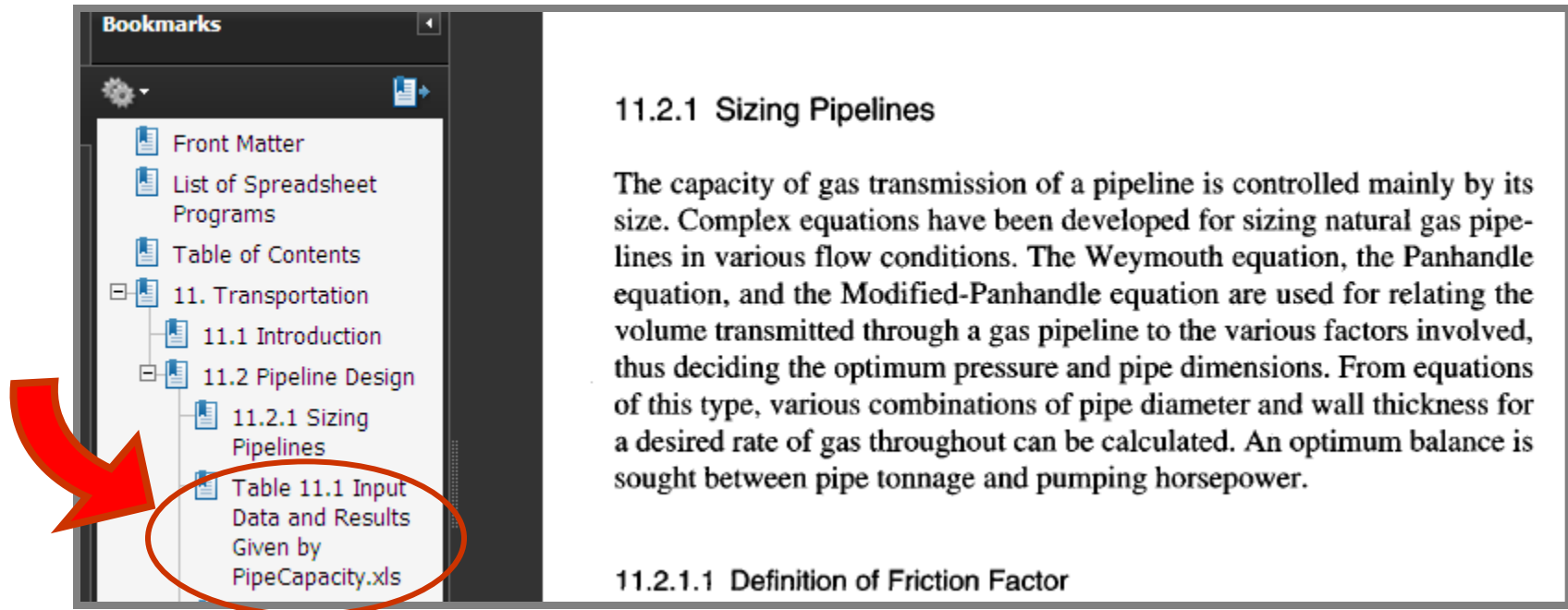
Sections	Relevancy	Contents
11.2.1 Sizing Pipelines	100 %	Text
8.2.1 Water Content of Natural Gas Streams	50 %	Text
9. Compression and Cooling	50 %	Text
9.1 Introduction	50 %	Text



**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 the Knovel interface. On the left is a 'Bookmarks' sidebar with a tree view. The selected item is 'Table 11.1 Input Data and Results Given by PipeCapacity.xls', which is highlighted with a blue background and a red circle. On the right is the content area for this table. At the top right of the content area, there is a blue link 'Click to View Calculation Example' with a red arrow pointing to it. Below the link is the table content, which includes instructions and input data.

**Click to View Calculation Example**

**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**

通常电子书查询到这边就无法继续提供其他加值功能。

Knovel可以提供互动表表格(蓝框标示的范围)来应用于工作流程中

# Knovel交互式表格– PipeCapacity.xls

	A	B	C	D	E	F	G
1	PipeCapacity.xls						
2	This spreadsheet computes capacity of gas pipelines.						
3	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <b>Instructions:</b>                      1. Update input data in blue;                      2. Run Macro Solution;                      3. View results.                 </div>						
4	<b>Input Data:</b>						
5		Pipe I.D.:				12.09	in.
6		Pipe roughness:				0.0006	in.
7		Pipeline length:				200	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							
47			Pipeline flow capacity =	$q_h = \frac{18.062T_b}{p_b} \sqrt{\frac{(p_1^2 - p_2^2)D^{16/3}}{\gamma_g \bar{T} Z L}}$			
48						1,076,035	cfh
49							

# Knovel交互式表格– PipeCapacity.xls –变更为工程师实际要计算的数据

	A	B	C	D	E	F	G
1	<b>PipeCapacity.xls</b>						
2	<b>This spreadsheet computes capacity of gas pipelines.</b>						
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							



# 转换单位– Knovel Unit Converter

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

The screenshot shows the Knovel website interface. At the top left is the Knovel logo. To its right is a search bar with the placeholder text "search knovel...". Further right are "Options" and "Search" buttons. Below the search bar is a navigation menu with the following items: "Home", "My Knovel", "Browse", "Data Search", "Tools", and "Natural Gas Engineering Handbook". The "Tools" menu is expanded, showing "Unit Converter" and "Periodic Table". A red circle highlights the "Tools" menu and its sub-items. A red arrow points from the top right towards the "Unit Converter" option.

# Results– Unit Converter (cfh to cym)

## Input

776397

Input Unit

ft<sup>3</sup>/h

OR

Select Input Unit

New Unit

Show units: US Cust. Metric All

UNIT SYMBOL (NAME)	PROPERTY
ft <sup>3</sup> /degF	Thermal expansion, volumetric
ft <sup>3</sup> /h	Flowrate, volumetric
ft <sup>3</sup> /lb	Specific volume
ft <sup>3</sup> /mile	Fuel consumption
ft <sup>3</sup> /min	Flowrate, volumetric
ft <sup>3</sup> /s	Flowrate, volumetric
ft <sup>3</sup> /yr	Flowrate, volumetric
ft <sup>2</sup> in/s	Diffusivity
ft <sup>2</sup> in/s	Viscosity, kinematic

Convert ▶▶

Flip Units ↕

Clear All

## Output

Significant Digits: - 4 + Notation: Decimal Sci. 10 Sci. e

479.3

Output Unit

yd<sup>3</sup>/min

OR

Select Output Unit

New Unit

Show units: US Cust. Metric All

UNIT SYMBOL (NAME)	PROPERTY
yd <sup>2</sup>	Area
yd <sup>3</sup>	Volume
yd <sup>3</sup> /degF	Thermal expansion, volumetric
yd <sup>3</sup> /min	Flowrate, volumetric
yd <sup>3</sup> /ton, UK	Specific volume
yd/degF	Thermal expansion, linear
year	Time
yr	Time



### Problem

一个航空航天工程师被要求调查喷气发动机过热的问题。

调查后发现一个由铝合金2219制成的零件，显示出在400至500 F 有失效的迹象。

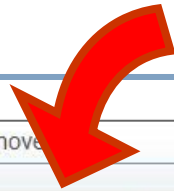
### Solution

这个工程师需要 ...

- 评估2219合金的热导系数(Thermal Conductivity)。
- 找出另一个具较高热导率的合金。
- 在升高的温度下，比较2合金的热导率。



点击Data Search



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Handbook of Civil Engineering Calculations  
ASM HANDBOOK 14B Metalworking Sheet Forming  
The Engineer's Handbook  
Machinery's Handbook

**Browse (My Subscription)**

AICHE/CCPS - Center for Chemical Process Safety	Industrial Engineering & Operations Management
ASME Boiler and Pressure Vessel Code 2001-2007	Mechanics & Mechanical Engineering
Adhesives, Coatings, Sealants & Inks	Metals & Metallurgy

**Engineering Cases**


**Energy and Exergy Analysis of Hydrogen Train Propulsion**  
G. Marin and G. F. Naterer, University of Ontario Institute of Technology, Oshawa. Posted 3/2/2011

**Hybrid Vehicle Effort Shifts 3-D Printing into High Gear**  
By Blaine McFarlane, mechanical engineer, KOR EcoLogic. Posted 2/17/2011

**Decentralized Approach to Treating the Organic Fraction of Municipal Solid Waste with Energy Recovery by Using Inclined Dry Anaerobic Digestion**  
By C. Visvanathan, Environmental Engineering and Management Program, School of Environment, Resource and Development, Asian Institute of Technology, Pathumthani, Bangkok, Thailand, Posted 2/14/2011



Material or Substance name = 2219  
And  
Thermal Conductivity exists

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### Data Search

Data Search retrieves numeric and other tabular data contained in Knovel's interactive graphs, equations and tables. Click in the Field box to display the available search fields. When you begin typing, the list is filtered.

Help

Field	Operator	Value
<input type="text" value="material or substance name"/>	<input type="text" value="is (=)"/>	<input type="text" value="2219"/>

And  Or  Not

Field	Operator
<input type="text" value="thermal conductivity"/>	<input type="text" value="exists"/>

Add another row

or clear form



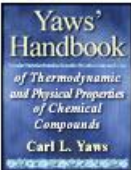











## Number of Relevant Titles

**COLLAPSE ALL**      **Number of Titles Retrieved: 6**      Page: 1 of 1      **Back to Data Search**

You searched for *(material or substance name = 2219) and (thermal conductivity EXISTS)*

[Add Search to My Knovel](#)

**Titles:**

			<b>Relevancy</b>
	<a href="#">Add Book to My Knovel</a> <a href="#">Search Within</a>		100 %
<b>Sections</b>		<b>Relevancy</b>	<b>Content Type</b>
	Thermal Conductivity of Gas (Live Eqns.)	100 %	<a href="#">Table (2)</a>
	Thermal Conductivity of Liquid (Live Eqns.)	100 %	<a href="#">Table (2)</a>
	<a href="#">Add Book to My Knovel</a> <a href="#">Search Within</a>		98 %
<b>Sections</b>		<b>Relevancy</b>	<b>Content Type</b>
	Physical Properties - English Units	100 %	<a href="#">Table (7)</a>
	Physical Properties - Metric Units	100 %	<a href="#">Table (7)</a>
	<b>Aluminum Alloy Database</b> 		97 %
	<b>Handbook of Materials for Product Design</b>  		95 %
	<b>Metallic Materials Properties Development and Standardization (MMPDS-05)</b>  		81 %
	<b>Metal Material Data Sheets</b> 		81 %

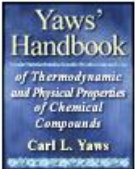



## 找到较相关性较高的书 - Aluminum Alloy Database

**COLLAPSE ALL**      Number of Titles Retrieved: 6    Page: 1 of 1      **Back to Data Search**


You searched for *(material or substance name = 2219) and (thermal conductivity EXISTS)*

**Titles:** **Relevancy**

	<input type="button" value="Add Book to My Knovel"/> <input type="button" value="Search Within"/>		
<b>Sections</b>		<b>Relevancy</b>	<b>Content Type</b>
Thermal Conductivity of Gas (Live Eqns.)		100 %	<a href="#">Table (2)</a>
Thermal Conductivity of Liquid (Live Eqns.)		100 %	<a href="#">Table (2)</a>

<b>Sections</b>		<b>Relevancy</b>	<b>Content Type</b>
Physical Properties - English Units		100 %	<a href="#">Table (7)</a>
Physical Properties - Metric Units		100 %	<a href="#">Table (7)</a>



- Aluminum Alloy Database** 97 %
- Handbook of Materials for Product Design** 95 %
- Metallic Materials Properties Development and Standardization (MMPDS-05)** 81 %
- Metal Material Data Sheets** 81 %





找出最相关的表格并打开

**You searched for (material or substance name = 2219) and (thermal conductivity EXISTS)**

**Aluminum Alloy Database** Search Within

By: Kaufman, J. Gilbert © 2004; 2009 Knovel

**Description:** This newly updated 2009 Knovel Aluminum Database is a comprehensive summary of physical, mechanical, and chemical properties of both wrought and cast aluminum alloys. The most important categories of properties, presented as interactive searchable and sortable tables, include: Estimated minimum mechanical properties; Fatigue properties; Creep and tensile properties; Fracture parameters; Physical properties...

Sections	Relevancy	Content Results
Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)	100 %	Table (5)
Table 4b. Typical Physical Properties of Wrought Aluminum Alloys (Metric Units)	100 %	Table (5)



Add to My Knovel

### Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Custom...

**Table:** Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)  
**Table Type:** Interactive Table  
**Search Query:** (material or substance name = 2219) and (thermal conductivity EXISTS)  
**Total Number of Search Hits:** 5  
**Total Number of Rows:** 153

互动表格信息

Pages: 1 of 1

Display: Data Found | All Data

#### Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)

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

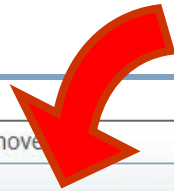
no.	alloy name	UNS no.	temper	density (lb/in <sup>3</sup> )	specific gravity	thermal expansi... (10 <sup>-6</sup> °F <sup>-1</sup> )	melting range (°F)	thermal cond. (Btu in/h ft <sup>2</sup> °F)
36	2219	A92219	O	0.103	2.84	12.4	1010-1190	1190
37	2219	A92219	T31,T37	0.103	2.84	12.4	1010-1190	780
38	2219	A92219	T62	0.103	2.84	12.4	1010-1190	840
39	2219	A92219	T81,T851	0.103	2.84	12.4	1010-1190	840
40	2219	A92219	T87	0.103	2.84	12.4	1010-1190	840

UNS no. is A92 \*

发现其热导率Thermal Conductivity范围: 780 – 1190



再到Data Search 寻找相似的铝合金



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ASM HANDBOOK 14B  
Handbook of Industrial Engineering  
Machinery's Handbook

**Engineering Cases**

Energy and Exergy Analysis of Hydrogen Train Propulsion  
G. Marin and G. F. Naterer, University of Ontario Institute of Technology, Oshawa. Posted 3/2/2011

Hybrid Vehicle Effort Shifts 3-D Printing into High Gear  
By Blaine McFarlane, mechanical engineer, KOR EcoLogic. Posted 2/17/2011

Decentralized Approach to Treating the Organic Fraction of Municipal Solid Waste with Energy Recovery by Using Inclined Dry Anaerobic Digestion  
By C. Visvanathan, Environmental Engineering and Management Program, School of Environment, Resource and Development, Asian Institute of Technology, Pathumthani, Bangkok, Thailand, Posted 2/14/2011

**Browse (My Subscription)**

AICHE/CCPS - Center for Chemical Process Safety Industrial Engineering & Operations Management  
ASME Boiler and Pressure Vessel Code 2001-2007 Mechanics & Mechanical Engineering  
Adhesives, Coatings, Sealants & Inks Metals & Metallurgy



UNS no. = A92\* (using wildcard)  
And  
Thermal Conductivity  $\geq 1190$  Btu in/(ft<sup>2</sup> h °F)

The screenshot shows the Knovel Data Search interface. At the top, there is a navigation bar with links for Home, My Knovel, Browse, Data Search, Tools, Support, Live Chat, and About Us. Below the navigation bar, the page title is "Data Search". A descriptive paragraph explains that the search retrieves numeric and other tabular data. The search criteria are defined in two rows:

Field	Operator	Value	Units
UNS no.	is (=)	A92*	
thermal conductivity	greater than or equal to	1190	Btu in/(ft <sup>2</sup> h °F)

Below the second row, there is a yellow tooltip with the text "0.51214 - 2.03212 Btu in/(ft<sup>2</sup> h °F)" and a green "Add another row" button. At the bottom right, there is a blue "Search" button and a red link "or clear form". A large red arrow points from the bottom right towards the search area.



Most Relevant Title is **Aluminum Alloy Database**

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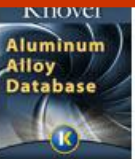
COLLAPSE ALL **Number of Titles Retrieved: 1** Page: 1 of 1 [Back to Data Search](#)



You searched for *(UNS no. = a92\*) and (thermal conductivity >= 1190 Btu in/h ft<sup>2</sup> °F)*

[Add Search to My Knovel](#)

**Titles:**

	<u>Relevancy</u>
 <b>Aluminum Alloy Database</b> 	100 %

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

Sections	Relevancy	Content Type
Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)	100 %	 <a href="#">Table</a> (5)
Table 4b. Typical Physical Properties of Wrought Aluminum Alloys (Metric Units)	100 %	 <a href="#">Table</a> (5)





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COLLAPSE ALL Number of Titles Retrieved: 1 Page: 1 of 1 Back to Data Search

You searched for *(UNS no. = a92\*) and (thermal conductivity >= 1190 Btu in/h ft<sup>2</sup> °F)*

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**Titles:**

Aluminum Alloy Database

Add Book to My Knovel Search Within

Sections	Relevancy	Content Type
Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)	100 %	Table (5)
Table 4b. Typical Physical Properties of Wrought Aluminum Alloys (Metric Units)	100 %	Table (5)



2014, 2017 and 2024 具较高的热导率Higher Thermal Conductivity  
我们从中选择(2014) 做进一步的检验

**Knovel** Add to My Knovel

### Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Custom...

**Table:** Table 4a. Typical Physical Properties of Wrought Aluminum Alloys (US Customary Units)  
**Table Type:** Interactive Table  
**Search Query:** (*UNS no. = a92\**) and (*thermal conductivity >= 1190 Btu in/h ft<sup>2</sup> °F*)  
**Total Number of Search Hits:** 5  
**Total Number of Rows:** 153

**Pages:** 1 of 1  
**Jump to:**   
**Display:** Data Found | **All Data**

no.	alloy name	UNS no.	temper	density (lb/in <sup>3</sup> )	specific gravity	thermal expansi... (10 <sup>-6</sup> °F <sup>-1</sup> )	melting range (°F)	thermal cond. (Btu in/h ft <sup>2</sup> °F)
19	2011	A92011	T8	0.102	2.83	12.7	1005-1190	1190
20	2014	A92014	O	0.101	2.8	12.8	945-1180	1340
24	2017	A92017	O	0.101	2.79	13.1	955-1185	1340
26	2024	A92024	O	0.1	2.78	12.9	935-1180	1340
36	2219	A92219	O	0.103	2.84	12.4	1010-1190	1190





## Basic Search – Looking at 2014 and 2219

Basic Search: **(2014 OR 2219) AND "thermal conductivity" AND temperature**

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<a href="#">Aerospace &amp; Radar Technology</a>	<a href="#">Metals &amp; Metallurgy</a>
<a href="#">Biochemistry, Biology &amp; Biotechnology</a>	<a href="#">Nanotechnology</a>
<a href="#">Ceramics &amp; Ceramic Engineering</a>	<a href="#">Oil &amp; Gas Engineering</a>
<a href="#">Chemistry &amp; Chemical Engineering</a>	<a href="#">Optics &amp; Photonics</a>
<a href="#">Civil Engineering &amp; Construction Materials</a>	<a href="#">Pharmaceuticals, Cosmetics &amp; Toiletries</a>
<a href="#">Earth Sciences</a>	<a href="#">Plastics &amp; Rubber</a>
<a href="#">Electrical &amp; Power Engineering</a>	<a href="#">Process Design, Control &amp; Automation</a>
<a href="#">Electronics &amp; Semiconductors</a>	<a href="#">Safety &amp; Industrial Hygiene</a>
<a href="#">Environment &amp; Environmental Engineering</a>	<a href="#">Sustainable Energy &amp; Development</a>
<a href="#">Food Science</a>	<a href="#">Textiles</a>
<a href="#">General Engineering &amp; Engineering Management</a>	<a href="#">Transportation Engineering</a>
<a href="#">Industrial Engineering &amp; Operations Management</a>	



找到最相关的书-Military Handbook, 并点选相关的互动表格

The screenshot shows the Knovel search results page. The search query is "(2014 or 2219) and 'thermal conductivity' and temperature". The results are sorted by relevancy. The top result is "Military Handbook - MIL-HDBK-5H: Metallic Materials and Elements for Aerospace Vehicle Structures (Knovel Interactive Edition)" with a 100% relevancy score. A red box highlights the title and the "Add Book to My Knovel" and "Search Within" buttons. Below the title, a table lists sections with their respective relevancy scores and content types. A red arrow points from the top result to the "Interactive Graphs - Temperature Effect on Physical Properties" section, which has a 100% relevancy score and contains two tables. Other sections include "Interactive Graphs for 3.2.1 2014 Alloy" (50% relevancy, 1 table), "Interactive Graphs for 3.2.7 2219 Alloy" (50% relevancy, 1 table), and "3.1.2 Material Properties" (25% relevancy, 1 text document). The second result is "Chemical Properties Handbook" with a 73% relevancy score.

Sections	Relevancy	Content Type
Interactive Graphs - Temperature Effect on Physical Properties	100 %	Table (2)
Interactive Graphs for 3.2.1 2014 Alloy	50 %	Table (1)
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3.1.2 Material Properties	25 %	Text



可以使用graph digitizer比较铝合金2014和2219在上升温度时的导热率Thermal Conductivity

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### Interactive Graphs - Temperature Effect on Physical Properties

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no.	alloy type	alloy name	synonyms	UNS no.	form	x-axis label	y-axis label	graph title	graph digitizer	figure no.
41	Aluminum Alloy...	2014	AA2014; AA 2014	A92014		Temperature	Thermal Conduc...	Effect of temper...		3.2.1.0
49	Aluminum Alloy...	2219	AA2219; AA 2219	A92219		Temperature	Thermal Conduc...	Effect of temper...		3.2.7.0



# Interactive Table – Temperature Effect on Physical Properties (2014 and 2219)

Select **Graph Digitizer** for 2219


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no.	alloy type	alloy name	synonyms	UNS no.	form	x-axis label	y-axis label	graph title	graph digitizer	figure no.
41	Aluminum Alloy...	2014	AA2014; AA 2014	A92014		Temperature	Thermal Conduc...	Effect of temper...		3.2.1.0
49	Aluminum Alloy...	2219	AA2219; AA 2219	A92219		Temperature	Thermal Conduc...	Effect of temper...		3.2.7.0

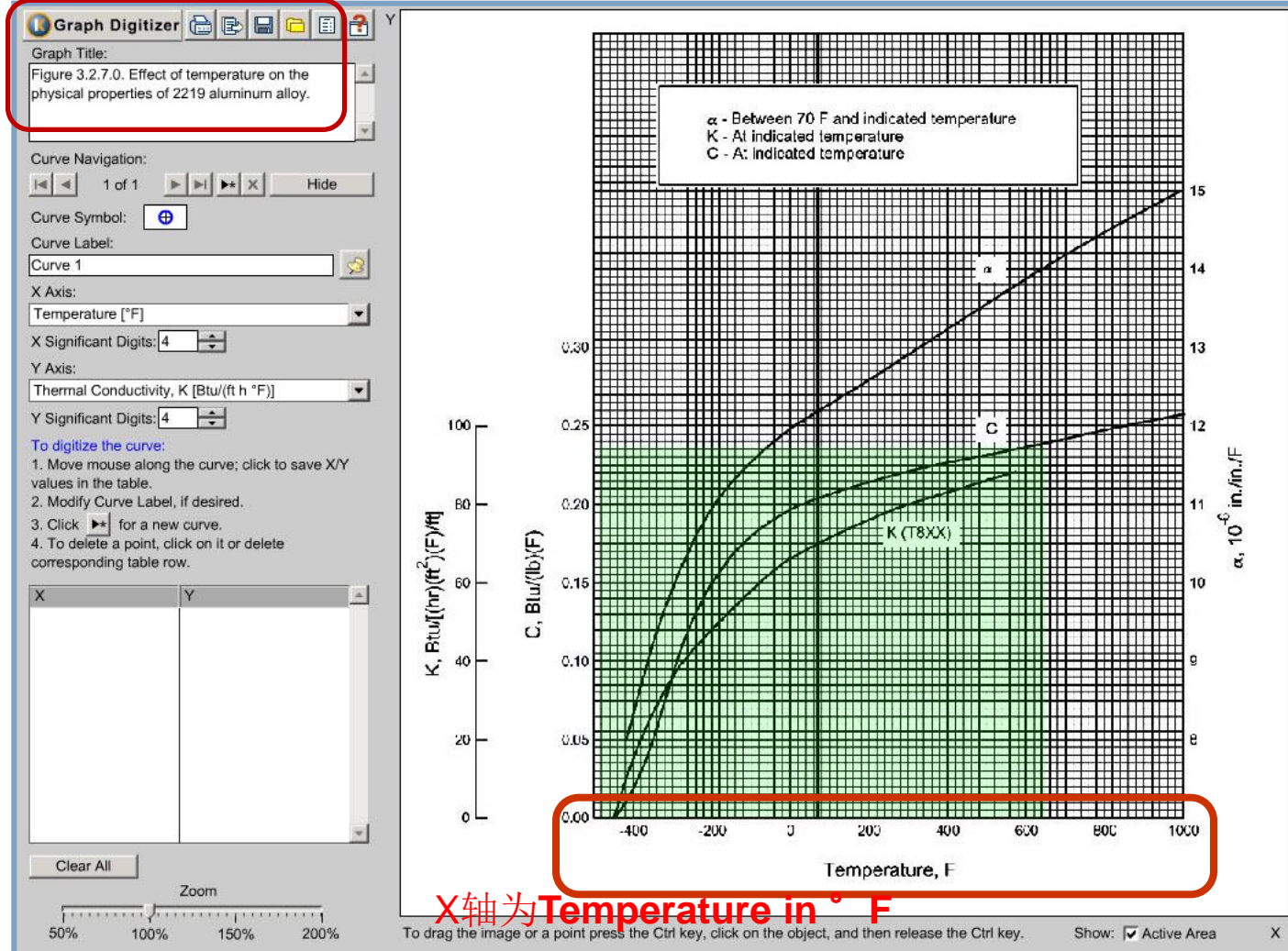






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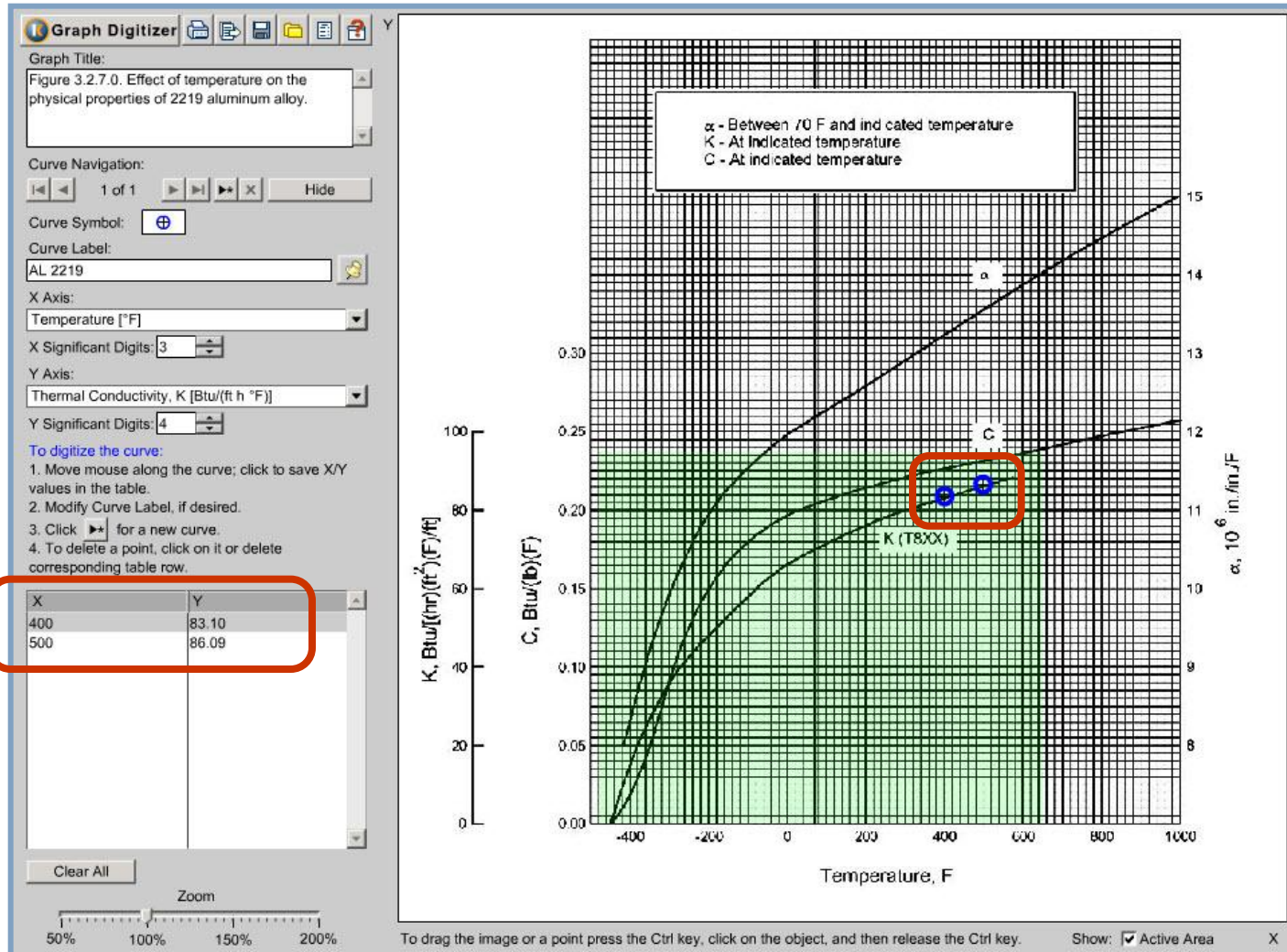
三条曲线分别代表不同单位的导热系数Coefficient of Thermal Expansion





# Interactive Content - Graph Digitizer – Plot points at 400 °F and 500 °F

找出导热系数K, 并在上头点选温度400, 500, 即可从动态表格上得出2219 (Original Material)的导热系数在这两个温度时为Thermal Conductivity Approx 82 - 86





数据可导出成为HTML or Excel档

### Figure 3.2.7.0. Effect of temperature on the physical properties of 2219 aluminum alloy.

AL 2219

Temperature [ $\hat{A}$ °F]	Thermal Conductivity, K [Btu/(ft h $\hat{A}$ °F)]
400.0	83.1
500.0	86.09

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	A	B	C	D	E	F	G	H
1	Figure 3.2.7.0. Effect of temperature on the physical properties of 2219 aluminum alloy.							
2	AL 2219							
3	Temperature [ $\hat{A}$ °F]	Thermal Conductivity, K [Btu/(ft h $\hat{A}$ °F)]						
4	400	83.1						
5	500	86.09						
6								
7								
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9								
10								
11								
12								





## 选择合金2014的Graph Digitizer

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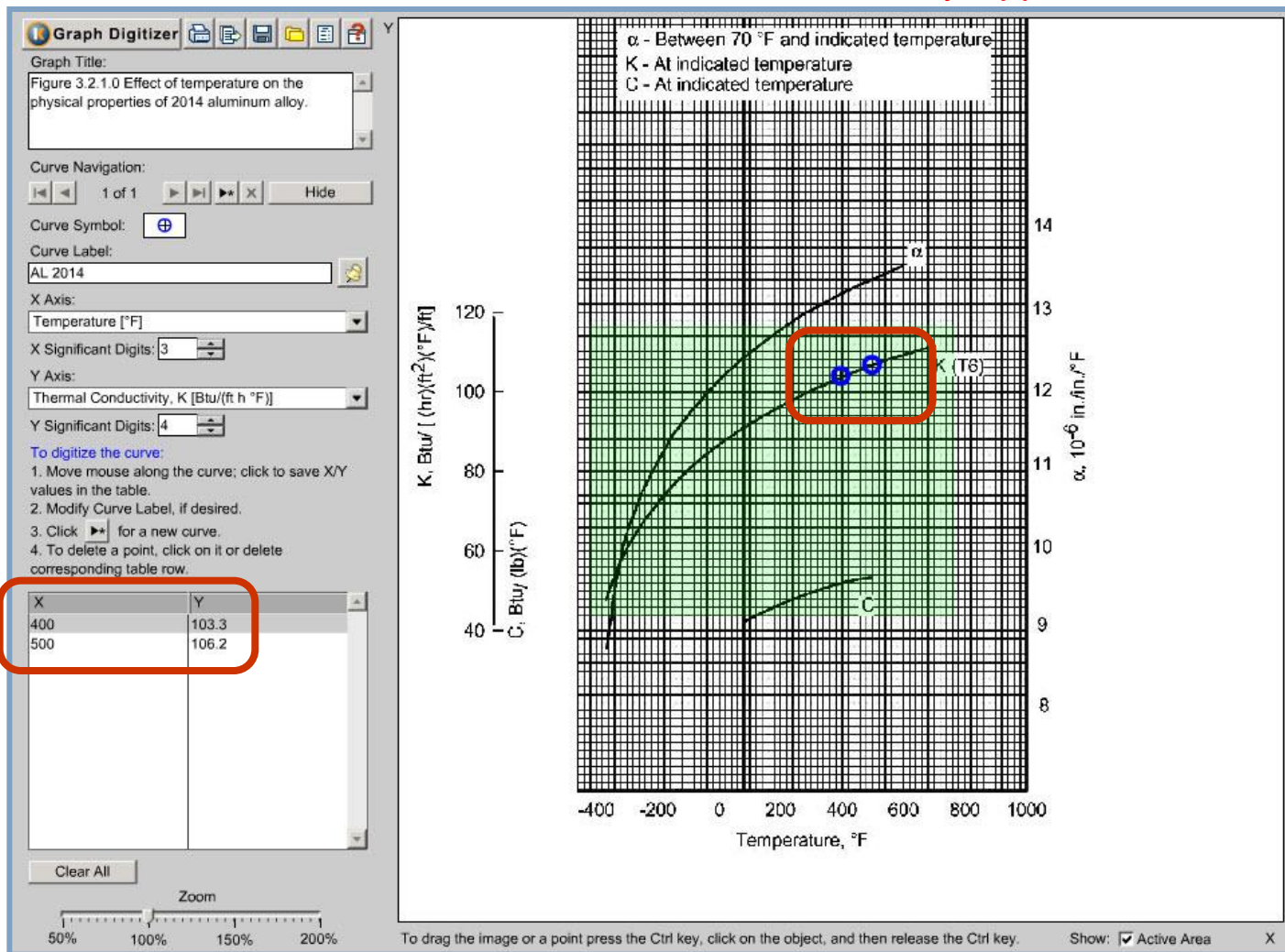
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no.	alloy type	alloy name	synonyms	UNS no.	form	x-axis label	y-axis label	graph title	graph digitizer	figure no.
41	Aluminum Alloy...	2014	AA2014; AA 2014	A92014		Temperature	Thermal Conduc...	Effect of temper...		3.2.1.0
49	Aluminum Alloy...	2219	AA2219; AA 2219	A92219		Temperature	Thermal Conduc...	Effect of temper...		3.2.7.0





找出导热系数K, 并在上头点选温度400, 500, 即可从动态表格上得出2214 (替代材料) 的导热系数在这两个温度时为Thermal Conductivity Approx 103-106





数据可导出成为HTML or Excel档

### Figure 3.2.1.0 Effect of temperature on the physical properties of 2014 aluminum alloy.

AL 2014

Temperature [ $\text{\AA}^\circ\text{F}$ ]	Thermal Conductivity, K [Btu/(ft h $\text{\AA}^\circ\text{F}$ )]
400.0	103.3
500.0	106.2

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	A	B	C	D	E	F	G	H
1	Figure 3.2.1.0 Effect of temperature on the physical properties of 2014 aluminum alloy.							
2	AL 2014							
3	Temperature [ $\text{\AA}^\circ\text{F}$ ]	Thermal Conductivity, K [Btu/(ft h $\text{\AA}^\circ\text{F}$ )]						
4	400	103.3						
5	500	106.2						
6								
7								
8	Military Handbook - MIL-HDBK-5H: Metallic Materials and Elements for Aerospace Vehicle Structures (Knovel Interactive Edition)							
9								
10								
11								
12								



我们可以发现若依照导热系数来看，合金2014与2219相比为较好的合金

### Figure 3.2.7.0. Effect of temperature on the physical properties of 2219 aluminum alloy.

AL 2219

Temperature [ $^{\circ}$ F]	Thermal Conductivity, K [Btu/(ft h $^{\circ}$ F)]
400.0	83.1
500.0	86.09

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1	Figure 3.2.7.0. Effect of temperature on the physical properties of 2219 aluminum alloy.								
2	AL 2219								
3	Temperature [°F]	Thermal Conductivity, K [Btu/(ft h °F)]							
4	400	83.1							
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6									
7									
8	Figure 3.2.1.0 Effect of temperature on the physical properties of 2014 aluminum alloy.								
9	AL 2014								
10	Temperature [°F]	Thermal Conductivity, K [Btu/(ft h °F)]							
11	400	103.3							
12	500	106.2							
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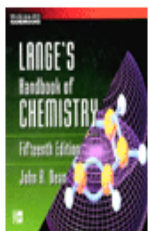
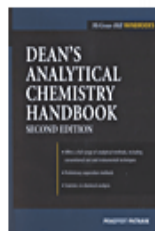
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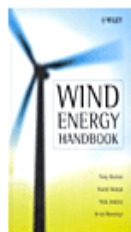


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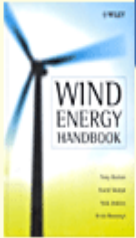
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