糸統可靠度實驗室 國立雲林科技大學工業工程與管理所



Minitab 管制圖的操作

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 TA:李佩熹

http://campusweb.yuntech.edu.tw/~qre/index.htm

管制圖的兩個階段

- 管制圖使用時必須要分成兩個階段。
- 階段1:收集資料(稱作歷史數據),繪製管制界限,將歷史數據繪製到管制圖上,若有樣本點落在管制界限外則需追查原因,若屬非機遇性原因則因別除數據,剔除後重新繪製管制圖,若樣本點落在管制界限外是管制圖誤判導致,則應保留數據。



管制圖的判讀

- 運用管制圖判斷製程是否失控,除了最基本的有點落 在管制界限外,判斷為製程失控外,另外還有以下數 種情況也隱含著製程失控的訊息。
- 1.同邊連串-同時連續有多個點落在中心線上方的管制區域或是下方的管制區域。點並非隨機散佈在兩者區域內。



管制圖的判讀



管制圖的判讀

4.靠近管制界限多點-大部分的點非常靠近管制界限但
 又沒有超出管制界限,此似乎有非機遇性原因發生。



 上述的四種現象,也都隱含著製程可能發生變異了, 須立刻追查製程變異原因。

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平均連串長度

- 平均連串長度(Average run length; ARL): 判讀製 程異常所需的平均抽樣次數。
- 當製程實際為正常狀態,但是管制圖卻出現異常資訊,此稱作假警報(False alarm),標準修華特管制圖(±3σ管制界限)的ARL₀=370.4,表示平均執行370.4次的抽樣會發生一次假警報,此時的ARL越大表示越不容易發生假警報。
- 當製程發生變異,偵測出製程變異所需的平均抽樣次 數表示為ARL₁,此ARL₁越小表示越快偵測出製程變 異,抽樣數量越大可以有效提升偵測製程變異的速度 (可以降低ARL₁)。



常態數據與非常態數據的影響

- 非常態分配分成對稱分配和偏態分配。
- 從一些研究報告發現,不論觀測數據是否為常態數 據,修華特平均數管制圖在偵測製程變異的速度並沒 有太大差異(ARL1差異不大)。
- 若用修華特平均數管制圖監控對稱分配的數據,假警報發生機率與常態差異也不大(ARL₀會接近 370.4)。但是,若用在監控偏態分配的數據則會經常發生假警報(ARL₀會明顯小於370.4),特別是單一觀測值的修華特管制圖更容易發生假警報(ARL₀甚至會小於100)。

 所以建議,若觀測資料是屬於偏態分配,應該將資料 轉換成對稱分配的資料,在進行製程監控,以降低假 國主要整理報聲為一葉度覺驗室 http://campusweb.yuntech.edu.tw/~gre/index.htm

計量值修華特管制圖的種類

- 監控製程平均數:
- 1. X-bar chart (抽樣數量>1)
- 2.Individual Measurements chart (抽樣數量=1)
- 監控製程變異數:
- 1.R chart (抽樣數量>1,且為小樣本)
- 2.S chart (抽樣數量>1,且為大樣本)
- 3.MR chart (抽樣數量=1)



繪製Xbar - R chart

 Stat→ Control Charts→ Variables Charts for Subgroups→ Xbar-R...





| Xbar-R Chart - Options 檢測製程異常的規則 Parameters Estimate S Limits Tests Stages Box-Cox Display |
|---|
| Ferform the following tests for special causes \bullet 1 whether the following tests for special causes |
| ▼ 1 point > 3 standard deviations from center line |
| □ 9 points in a now on same side of center line 連續9點落在同一邊 |
| 6 points in a row, all increasing or all decreasing |
| □ 14 points in a gow, alternating up and down 連續6點遞增或遞減 |
| □ 2 out of 3 points > 2 standard deviations from center line (same side) □ 4 out of 5 points > 1 standard deviation from center line (same side) 連續14點上下循環 |
| 15 points in a row within 1 standard deviation of center line (either side) |
| \square 8 points in a row > 1 standard deviation from center line (either side) |
| 連續15點落在上下1σ |
| Help QK 範圍內 |
| 連續8點落在上下1σ 範圍外 Main main main main main main main main m |

| Xbar-R Chart - Options | × |
|--|------------|
| Parameters Estimate S Limits Tests Stages Box-Cox Display | Stouage |
| Perform the following tests for special causes | |
| I point > 3 standard deviations from center line | ;中有2點落在2σ以 |
| 9 points in a row on same side of center line | 外(同一邊) |
| 6 points in a row, all increasing or all decreasing | |
| 🔲 14 points in a yow, alternating up and down | |
| 🔲 2 out of 3 points > 2 standard deviations from center line (same side) | |
| 4 out of 5 points > 1 standard deviation from center line (same side) | |
| 📃 🔲 15 points in a 10 <u>w</u> within 1 standard deviation of center line (eit <mark>he</mark> r side) | |
| 8 points in a row > 1 stan <u>d</u> ard deviation from center line (either side) | |
| | |
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| | Cancel |
| | |
| 5點中有4點 | - 落在1σ以 |
| | 一邊) |
| 國工芸杯杆技大学系統可菲度實驗至 http://campusweb.vuntech.edu.tw/~qre/index.htm | |



Box-Cox轉換函數

• 原始的Box-Cox轉換函數

$$w(y,\lambda) = \begin{cases} (y^{\lambda} - 1)/\lambda, \text{ if } \lambda \neq 0\\ \ln(y), & \text{ if } \lambda = 0 \end{cases}$$

$$\lambda \quad \text{ 轉換函數}$$

$$2 \quad w = y^{2}$$

$$0.5 \quad w = \sqrt{y}$$
• Minitab的Box-Cox轉換函數

$$w(y,\lambda) = \begin{cases} y^{\lambda}, & \text{ if } \lambda \neq 0\\ \ln(y), & \text{ if } \lambda = 0 \end{cases}$$

$$-0.5 \quad w = 1/\sqrt{y}$$

$$-2 \quad w = 1/y^{2}$$



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| bar-R Chart - Options Pavameters Estimate S Limits Tests Stages Box-Cox Display Storage Subgroups to display ① Display all subgroups ① Display last 25 subgroups Subgroups for display purposes |
|---|
| ○ Do not split ○ Each segment contains ○ Each segment comesponds to a stage (11 chart has stages) ○ Each segment comesponds to a stage (11 chart has stages) ■ Test mesults ▼ Display test mesults in Session window ■ Help |
| Store these values for each point Point plotted Subgroup size Center line value Iest results Control limit values Stage |
| tp://campusweb.yuntech.edu.tw/~qre/index.htm Help OK Cancel |

繪製Xbar-R Chart 實例 (Ex. 1)

請用Period 1~15期的數據設置Xbar - R chart管制界
 限,用Period 16~25期數據進行製程監控。

| Period | x1 | x2 | x3 | x4 | x5 |
|--------|-------|-------|-------|-------|-------|
| 1 | 15.60 | 14.30 | 17.70 | 14.50 | 15.00 |
| 2 | 15.00 | 14.80 | 16.80 | 16.90 | 17.40 |
| 3 | 16.40 | 15.10 | 15.70 | 17.20 | 16.60 |
| 4 | 14.20 | 14.80 | 17.10 | 15.00 | 16.50 |
| 5 | 16.40 | 16.50 | 17.20 | 17.60 | 15.10 |
| 6 | 14.80 | 17.20 | 16.80 | 15.30 | 14.20 |
| 7 | 17.60 | 17.20 | 14.80 | 17.00 | 14.60 |
| 8 | 14.20 | 17.60 | 16.80 | 14.20 | 14.90 |
| 9 | 17.20 | 16.70 | 15.30 | 14.60 | 15.20 |
| 10 | 14.80 | 14.30 | 14.70 | 16.50 | 14.90 |
| 11 | 14.60 | 15.50 | 15.80 | 14.80 | 14.20 |
| 12 | 15.10 | 15.30 | 15.90 | 15.00 | 17.20 |
| 13 | 17.40 | 15.20 | 16.80 | 16.20 | 15.40 |
| 14 | 15.30 | 16.90 | 17.80 | 17.20 | 17.10 |
| 15 | 14.80 | 15.10 | 16.60 | 16.30 | 14.50 |

| Period | x1 | x2 | x3 | x4 | x5 |
|--------|-------|-------|-------|-------|-------|
| 16 | 16.10 | 14.60 | 17.50 | 16.80 | 17.60 |
| 17 | 14.20 | 14.70 | 15.30 | 15.70 | 14.60 |
| 18 | 14.60 | 17.20 | 16.00 | 16.70 | 16.40 |
| 19 | 15.90 | 16.50 | 16.20 | 15.00 | 17.20 |
| 20 | 16.20 | 14.80 | 15.00 | 15.10 | 15.60 |
| 21 | 16.30 | 15.40 | 14.60 | 17.40 | 14.80 |
| 22 | 15.00 | 17.20 | 14.80 | 17.00 | 16.80 |
| 23 | 16.40 | 15.90 | 16.70 | 15.70 | 16.20 |
| 24 | 16.60 | 15.10 | 14.60 | 17.20 | 17.00 |
| 25 | 17.00 | 17.10 | 16.80 | 16.20 | 17.60 |
| | | | | 1.0 | |

| <u>F</u> ile | <u>E</u> dit D | D <u>a</u> ta | <u>C</u> alc <u>S</u> tat | <u>G</u> raph E <u>d</u> it | or <u>T</u> ools <u>y</u> | <u>M</u> indow <u>H</u> e | lp | | | | | | | | |
|--------------|----------------|---------------|---------------------------|-----------------------------|---------------------------|---------------------------|------------|---------|-------|--------|---------------|--------|---------|------|---------|
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| | C1 | | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 | C13 | C1 |
| Pe | riod. | _S | setup | | | | Period_M | monitor | | | | | | | |
| | | 1 | 15.6 | Porio | nd 1 | | 16 | 16.1 | Dor | 1 | 6 | | | | |
| | | 1 | 14.3 | | | | 16 | 14.6 | | | 0 | | | | |
| | | 1 | 17.7 | 額浿 | 值 | | 16 | 17.5 | ~額 | 測值 | | | | | |
| _ | | 1 | 14.5 | P20.0 | | | 16 | 16.8 | P70 | | | | | | |
| | | 1 | 15.0 | | | | 16 | 17.6 | | | 7 | | | | |
| | | 2 | 15.0 | Peric | od 2 | | 17 | 14.2 | Per | I DO | / | | | | |
| _ | | 2 | 14.8 | 45- 2- |)) L | | 17 | 14.7 | 調 | 训估 | | | | | |
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| - | | 2 | 10.9 | | | | 17 | 14.6 |) | | | | | | |
| - | | 3 | 16.4 | | 1.0 | | 17 | 14.0 | | | | | | | |
| | | 3 | 15.1 | Peric |)d 3 | | 18 | 17.2 | | | | | | | |
| | | 3 | 15.7 | 韵识 | 一仕 | | 18 | 16.0 | | | | | | | |
| | | 3 | 17.2 | 観沢 | 旧 | | 18 | 16.7 | | | | | | | |
| | | 3 | 16.6 | | | | 18 | 16.4 | | | | | | | |
| | | 4 | 14.2 | Doric | Nd 1 | | 19 | 15.9 | | | | | | | |
| | | 4 | 14.8 | Penc | JU 4 | | 19 | 16.5 | | | | | | | |
| | | 4 | 17.1 | | 佔 | | 19 | 16.2 | | | | | | | |
| | | 4 | 15.0 | 利小 | 11臣 | | 19 | 15.0 | 生 | 177 日午 | lob | | | | |
| | | 4 | 16.5 | | | | 19 | 17.2 | 彩 | 杠缸 | 羟 | | | | |
| | | 5 | 16.4 | | | | 20 | 16.2 | | 的數 | 虔 | | | | |
| | | 5 | 16.5 | むり | 罢 祭 生 | al 🛛 | 20 | 14.8 | ! | 1) 女1 | 豕 | | | | |
| _ | | 5 | 17.2 | 叹」 | 且日川 | 1.1 | 20 | 15.0 | | | | | | | |
| | | 5 | 17.6 | 圖自 | 内敷お | 長 | 20 | 15.1 | | | | | | | |
| _ | | 2 | 10.1 | | | 7 - | 20 | 15.0 | | | | | | | |
| | | 6 | 14.0 | | | | 21 | 10.3 | | | | | | | |
| | | 0 | 17.2 | | | | 211 | 10.41 | | | | | | | |
| it Wo | rksheet: ' | Work | sheet 1 | | | | | | | | | | | 1 | 1:05 PM |
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 Stat→ Control Charts→ Variables Charts for Subgroups→ Xbar-R...

| Xbar-R Chart | | | × | |
|--|---|------------------------------------|--|------------|
| C1 Period_S C2 setup C6 Period_M C7 monitor | All observations for a char setup Subgroup sizes: 5 | t sie in one column: (enter a : | 上 指定設 圖數打 number or D column) | 置管制 豪欄位 |
| Select | <u>S</u> cale <u>M</u> ultiple Graphs | Labels Data Options | 每次抽5個樣 | 本 |
| Help | | QK | Cancel | |
| 國立雲林科技大學系統可靠 http://campusweb.yuntech.edu.t | ፤度實驗室 w/~qre/index.htm | | | |

| 出 m T L 由 f | Chart - Options | × |
|---|---|--------|
| 聚桂半均數和 Paramet | ers Estimate S Limits Tests Stages Box-Cox Display St | touage |
| 標準差未知, To spec | ify the values for one or both parameters, enter them here. MINITAB uses t instead of estimating them from the data. | these |
| 所以空白 Mean: | | |
| | | |
| <u>_</u> ∑tanda | d deviation:) | |
| Xbar-R Chart - Options | × | |
| Parameters Estimate S Limits Tests Stages Box | -Cox Display Storage | |
| Omit the following subgroups when estimating parameters (eg | 3 12:15) | |
| | | |
| Method for estimating standard deviation Subgroup size > 1 | | |
| • Rbar | | |
| C Fooled standard deviation | 用全距估計標 準差 | |
| | | |
| Use unbiasing constant | | |
| | | |
| Help | Cancel | |
| 立雲林科技大學 系統可靠度實驗室 | | |
| p://campusweb.yuntech.edu.tw/~qre/index.htm | | |
| | | |
| | | |

| Parameters Estimate S Limits Stages Box-Cox Display Storage Ferform the following tests for special causes • • 1 point > 3 standard deviations from center line • 9 points in a row on same side of center line 3 • 6 points in a row, all increasing or all decreasing 9 • 14 points in a gow, alternating up and down 6 • 2 out of 3 points > 2 standard deviations from center line (same side) 14 • 4 out of 5 points > 1 standard deviation from center line (same side) 2 • 15 points in a row vithin 1 standard deviation of center line (either side) 4 • 8 points in a row > 1 standard deviation from center line (either side) 15 • 8 points in a row > 1 standard deviation from center line (either side) 15 • 15 15 15 • 15 15 15 • 14 15 15 • 15 15 15 • 15 15 15 • 15 15 15 • 15 15 |
|---|
| C Other (enter a value between -5 and 5): |

| Par-R Chart - Options Parameters Estimate S Limits Tests Stag Subgroups to display © Display all subgroups © Display last 20 subgroups Split chart into a series of segments for display pr © Do not split © Each segment contains © Each segment contains | res Box-Cox Display Hoxage |
|--|---|
| Test results | Parameters Estimate S Limits Tests Stages Box-Cox Display Storage Store these estimates for each chart Image: Store these estimates for each chart Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values for each point Image: Store these values Image: Store these values Image: Store these values for each point Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Image: Store these values Im |
| L雲林科技大學 系統可靠度實驗 ://campusweb.yuntech.edu.tw/~qre/inac | Help OK Cancel |



 完成管制界限設置,圖中沒有落在管制界限外的數 據,平均數為15.824,標準差為1.09774



- 開始製程監控,
- Stat → Control Charts → Variables Charts for Subgroups → Xbar-R...

| | Xbar-R Chart | X |
|-------------|--|---|
| | C1 Peniod_S C2 setup C6 Peniod_M C7 monitor C8 MEAN1 C9 STDE1 Select | All observations for a chart are in one column: monitod 指定製成監控 Subgroup sizes: 5 (enter a number or D column) Scale <u>Labels</u> <u>All observations for a chart are in one column</u> : <u>Subgroup sizes:</u> 5 (enter a number or D column) <u>Scale</u> <u>Labels</u> <u>All observations for a chart are in one column</u> : <u>Scale</u> <u>Labels</u> <u>Scale</u> <u>Labels</u> <u>Scale</u> <u>Labels</u> <u>Scale</u> <u>Scale</u> <u>Scale</u> <u>Labels</u> <u>Scale</u> |
| 國: httr_ | Help | OK Cancel |

| Xbar-R Chart - Options |
|---|
| 輸入先前得到 Parameters Estimate S Limits Tests Stages Box-Cox Display Storage |
| 的製程平均數 To specify the values for one or both parameters, enter them here. MINITAB uses these values instead of estimating them from the data. |
| 和標準差 <u>Mesan:</u> 15.824 |
| Standaud deviation: 1.09774 |
| Xbar-R Chart - Options |
| Parameters Estimate S Limite Tests Stages Box-Cox Display Storage |
| Perform the following tests for special causes |
| ✓ 1 point > 3 standard deviations from center line |
| 9 points in a now on same side of center line |
| 6 points in a now, all increasing or all decreasing 9 OK Cancel |
| 14 points in a yow, alternating up and down |
| 2 out of 3 points > 2 standard deviations from center line (same side) 14 |
| 1 ± 4 out of 5 points > 1 standard deviation from center line (same side) |
| 15 points in a row within 1 standard deviation of center line (either side) |
| ■ 8 points in a now > 1 standard deviation from center line (either side) 15 |
| |
| |
| |
| Heip <u>QK</u> Cancel |
| 立雲林科技大學 系統可靠度實驗室 |
| tp://campusweb.vuntech.edu.tw/~are/index.htm |

| Xbar-R Chart - Options | × |
|---|---|
| Pauameteus Estimate S Limits Tests Stages Box-Cox | Display Stonage |
| Use a Box-Cox transformation (W = Y**Lambda) Lambda = Q (natural log) Lambda = 0.5 (square root) Optimal lambda Optimal lambda for each stage (in a chart with stages) Other (enter a value between -5 and 5): | Xbar-R Chart - Options Pauameters Estimate S Limits Tests Stages Box-Cot Display Subgroups to display Image: Display all subgroups Display last Split chart into a series of segments for display purposes Do not split Each segment contains Subgroups Test results Test results |
| Xbar-R Chart - Options Parameters Estimate S Limits Tests Stages Box-Cox Display Store these estimates for each chart Means Store these values for each point | Help OK Cancel |
| Point plotted Subgroup size Center line value Iest results Control limit values Stage | |





 · 沒有點落在管制界限外,所以判讀製程為正常 狀態。

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繪製Xbar - S chart

- Stat → Control Charts → Variables Charts for Subgroups → Xbar-S...
- 設定方法如同Xbar R chart

| | Xbar-S Chart | | × |
|-----------|--------------|--|---|
| | | All observations for a chart are in one column: | |
| | | 管制圖的設定 | |
| | | Subgroup sizes: (enter a number on ID column) | |
| | | Scale Labels | |
| | Select | <u>M</u> ultiple Graphs D <u>a</u> ta Options Xbar-S Options | |
| 國 hti_ | Help | <u>QK</u> Cancel | |

| Kbar-S (| Chart - Options | × |
|--------------------------------|---|--|
| Paramete | ers Estimate S Limits Tests | Stages Box-Cox Display Storage |
| lo spec values i | By the values for one or both parametrinstead of estimating them from the d | ers, enter them here. MINITAB uses these ata. |
| <u>M</u> ean: | | |
| <u>S</u> təndər | d deviation: | |
| X | bar-S Chart - Options | 同Xbar-R Chart的設定方法 |
| | Parameters Estimate S Limits | Tests Stages Box-Cox Display Stonage |
| | Omit the following subgroups when | estimating parameters (eg. 3 12:15) |
| | Method for estimating starter & | 韩善未知時,選擇估計方式 |
| | Sbar Booled standard deviation | 用每次抽樣的觀測職標準差 |
| | | 的平均數估計製程標準差 |
| | ▼ Use unbiasing constant | 統的標準差估計方法 |
| | | |
| | | |

| Xbar-S Chart - Options | × |
|--|---|
| Parameters Estimate S Limits Tests Stages Box-Cox Disp | lay Storage |
| Ferform the following tests for special causes | |
| ✓ 1 point > 3 standard deviations from center line | |
| 9 points in a row on same side of center line | 3 |
| 🔲 6 points in a now, all increasing or all decreasing | 9 |
| 14 points in a row, alternating up and down | 6 |
| 2 out of 3 points > 2 standard deviations from center line (same side | 」 III 同Xhar-R Chart铅定 |
| 🔲 4 out of 5 points > 1 standard deviation from center line (same side) | |
| \square 15 points in a row within 1 standard deviation of center line (either | ide) 4 |
| 8 points in a row > 1 stan <u>d</u> ard deviation from center line (either s ¹²) | har-S Chart - Ontions |
| Xbar-S Chart - Options | |
| Parameters Estimate S Limits Tests Stages Box-Cox Displ | -Subrouns to display |
| Use a Box-Cox transformation (W = Y ⁴⁶⁴ Lambda) | Display all subgroups |
| Iambda = Q (natural log) | O Display last Z subgioups |
| C Lambda = 0.5 (square root) | |
| Optimal lambda for each stage (in a chart with stages) | -Split chart into a series of segments for display purposes |
| C Other (enter a value between -5 and 5): | © Do not split |
| | <u>Bach segment contains</u> subgroups <u>See a segment comparends to a stars (st about has starse)</u> |
| | Caracter segment comesponds to a Stage (it chair has stages) |
| | Test results |
| | Display test results in Session window |
| | |
| | Help <u>OK</u> Cancel |
| Help | Cancel |

繪製Xbar-S Chart 實例 (Ex. 2)

- 以EX. 1數據做說明
- Stat → Control Charts → Variables Charts for Subgroups → Xbar-S...

| C1 Period_S | All observations for a chart are in one column: | |
|--|---|--|
| 26 Period_M 26 Period_M 27 monitor | setup | |
| | Subgroup sizes: 5 (enter a number or ID column) | |
| | Scale Labels Multiple Graphs Data Options | |
| Select | | |
| Help | <u>O</u> K Cancel | |

| 製程平均數和 標準差未知, 所以空白 Mean: Standaud deviation: | |
|---|---|
| Xbar-S Chart - Options X Parameters Estimate Omit the following subgroups when estimating parameters (eg. 3 12:15) Image: Cancel Method for estimating standard deviation Image: Cancel Subgroup size > 1 Image: Cancel | |
| Pooled standaud deviation 以每次抽樣的標準差平均數來估計製程標準差 ✓ Use unbiasing constant | |
| 國立雲林科技大學 系統可靠度實驗室 http://campusweb.yuntech.edu.tw/~qre/index.htm | 约 |

| | Xbar-S Chart - Options |
|---|---|
| | Pauameteus Estimate S Limite Tests Stages Box-Cox Display Stouage |
| | Perform the following tests for special causes |
| | ✓ 1 point > 3.0 standard deviations from center line |
| | 9 points in a row on same side of center line 3.0 |
| | 6 points in a now, all increasing or all decreasing |
| | 14 points in a yow, alternating up and down |
| | 2 out of 3 points > 2 standard deviations from center line (same side) 14 |
| Xbar-S Chart - Options | 4 out of 5 points > 1 standard deviation from center line (same side) |
| Parameters Estimate S Limits Tests Stages Box-Cox I | 15 points in a row within 1 standard deviation of center line (either side) |
| Use a Box-Cox transformation (W = Y**Lambda) | 8 points in a row > 1 standard deviation from center line (either side) 15 |
| C Lambda = 0 (natural loz) | |
| C Lambda = 0.5 (square root) | |
| C Optimal lambda Xbar-S Char | Help <u>OK</u> Cancel |
| C Other (enter a value between -5 and 5); | Estimate S Limits Tests Stages Box-Cox Display Stowage |
| Steen these | stimates for each of ant |
| Means | ▼ 記錄下平均數和標 |
| | |
| | —————————————————————————————————————— |
| Store these t | values for each point |
| Doint p | lotted Subgroup size |
| | line value <u>I</u> est iesults |
| Help | |
| | |
| | |
| 國立雲林科技大學 系統可靠度實驗室 | |
| http://campusweb.yuntech.edu.tw/~qre/index.ht | <u>QK</u> Cancel |



 完成管制界限設置,圖中沒有落在管制界限外的數 據,平均數為15.824,標準差為1.14520



| 大、小公田二 | Xbar-S Chart - Options | × |
|--------|--|-----|
| 輸入先前得到 | Parameters Estimate S Limits Tests Stages Box-Cox Display Storage | |
| 的製程平均數 | To specify the values for one or both parameters, enter them here. MINITAB uses these values instead of estimating them from the data. | |
| 和標準差 | Mean: 15.824 | - 1 |
| | | |
| | Standard deviation: 1.14.220 | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | Help <u>O</u> K Cancel | |

• 其他設定與Xbar-R Chart相同

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 · 沒有點落在管制界限外,所以判讀製程為正常 狀態。



Xbar chart、S chart 和 R chart

• 其餘的三個管制圖的設定與使用與Xbar – R chart相同。



繪製IM - MR chart

 Stat → Control Charts → Control Charts for Individuals → I-MR...

| Individuals-Moving Range | e Chart | | × | |
|--------------------------|--|---|--------------|---|
| 給予觀測值相 | Waniables: 第位,只 | | A | |
| 能有一 | 欄 | ~ | _ | |
| | | 管制圆台 | 的空目下。 | - 百 |
| | Contra 1 | | JUCKET | <u></u> |
| | <u>a</u> caie <u>M</u> ultiple Graphs | <u>L</u> aters D <u>a</u> ta Options | I-MR Options | |
| Select | | | | |
| Help | | Ōĸ | Cancel | |
| 國立雲林科技大學 系統可靠度 | 實驗室 | | | |

| 製程平均數和 標准 羊 去 知 , |
|---|
| 标午左木丸 / Mean: 所以空白 <u>Mean</u> : <u>S</u> tandard deviation: |
| Individuals-Moving Range Chart - Options X Parameters Estimate S Limits Tests Stages Box-Cox Display Storage Omit the following subgroups when estimating parameters (eg, 3 12:15) Image: Comparison of the following subgroups when estimating parameters (eg, 3 12:15) Image: Comparison of the following subgroups when estimating parameters (eg, 3 12:15) |
| Method for estimating standard deviation Subgroup size = 1 ① Average moving range ① Median moving range Length of moving range: 2 Cancel |
| 移動全距的期數 HelpKK _K |
| Individuals-Moving Range Chart - Options Parameters Estimate S Limits Tests Stages Box-Cox Display Storage Featom the following tests for special causes • • • • I point > 3.0 standard deviations from center line 3.0 • • 9 points in a row on same side of center line 3.0 • • 6 points in a row, all increasing or all decreasing 9 • • 14 points in a yow, alternating up and down • • • 4 out of 5 points > 1 standard deviation from center line (same side) 14 • 15 points in a row vithin 1 standard deviation of center line (either side) • • 8 points in a row > 1 standard deviation from center line (either side) • • 15 points in a row > 1 standard deviation from center line (either side) • • 16 points in a row > 1 standard deviation from center line (either side) • • 17 points in a row > 1 standard deviation from center line (either side) • • 18 points in a row > 1 standard deviation from center line (either side) • • • 16 • • |
| Halp ①K ● 同Xbar & R chart ● 行政 a Bar & R chart |
| 國立雲林科技大學系統可靠度實驗室 http://campusweb.yuntech.edu.tw/~qre/index.htm |

| ndividuals-Moving Range Chart - Options | × |
|---|---|
| Parameters Estimate S Limits Tests Stages Bos Subgroups to display | c-Cox Display Storage |
| Display all subgroups Display last Z subgroups | |
| Split chart into a series of segments for display purposes Do not split Each segment contains Each segment comesponds to a stage (11 chart has stage | aubgaoups s) |
| Test results Display test results in Session window Help <u>O</u> K | Individuals-Moving Range Chart - Options Parameters Estimate Store these estimates for each chart Means Standard deviations |
| • 同Xbar &R chart | Store these values for each point Store these values for each point |
| 立雲林科技大學 系統可靠度實驗室 p://campusweb.yuntech.edu.tw/~qre/index.htm | Help <u>OK</u> Cancel |

繪製IM-MR Chart 實例 (Ex. 3)

| • 以period 1~15數據設直 | Period_setup setup_x | | Period monitor Monitor x | |
|-----------------------|----------------------|-------|--------------------------|-------|
| IM MD Chart 答判 思思 | 1 | 33.75 | | 33.5 |
| TIVI-IVIN CHAILE 前分下区 | 2 | 33.05 | 17 | 33.25 |
| 以Period 16~30數據 | 3 | 34 | 18 | 33.4 |
| | 4 | 33.81 | 19 | 33.27 |
| 監控製程 | 5 | 33.46 | 20 | 33.65 |
| | 6 | 34.02 | 21 | 34.8 |
| | 7 | 33.68 | 22 | 34.55 |
| | 8 | 33.27 | 23 | 35 |
| | 9 | 33.49 | 24 | 34.75 |
| | 10 | 33.2 | 25 | 34.5 |
| | 11 | 33.62 | 26 | 34.7 |
| | 12 | 33 | 27 | 34.29 |
| | 13 | 33.54 | 28 | 34.61 |
| | 14 | 33.12 | 29 | 34.49 |
| | 15 | 33.84 | 30 | 35.03 |
| | | | | |





 Stat → Control Charts → Control Charts for Individuals → I-MR...

| Individuals-Moving Range C1 Period_setup C2 setup_x C7 Period_monitor C8 Monitor_x | e Chart Variables: 'setup_x' | | | 図 | 制品 | 腔迹 |
|--|--|------------------------|---|--------|----|------------|
| | <u>S</u> cale <u>M</u> ultiple Graphs | Labels Data Options | | Sh ~ y | 家欄 | 位 |
| Select Help | | <u>O</u> K | C | ancel | | |
| 上而让刘让上曲《从一步, | * 虚 5 | | | | | NOD |

| | Parameters Estimate S Limits Tests Stages Box-Cox Display Storage |
|---|--|
| | To specify the values for one or both parameters, enter them here. MINITAB uses these values instead of estimating them from the data. |
| | Mean: |
| | |
| | Standard deviation: |
| | |
| Widuals-Moving Range Chart - Options | |
| mameters is unated a Limits lests at a stages if | Construction and the storage |
| | |
| -Method for estimating standard deviation | |
| Subgroup size = 1 | |
| [●] <u>Average moving range</u> 使用 | 平均移動全距估計標準差 |
| Ulledian moving range | |
| Length of moving range: 2 | |
| | 2期的移動全距 |
| | |
| ж. 1 от | |
| | |
| uameters Estimate S Limits Tests Stages Bo Perform the following tests for special causes 1 point > 3 standard deviations from center line 9 points in a row on same side of center line 6 points in a row, all increasing or all decreasing 14 points in a gow, alternating up and down | xx-Cox Display Stouage 3 3 9 6 |
| 2 out of 3 points > 2 standard deviations from easter V | ine (same side) 14 |
| 2 out or 5 points > 2 statustic deviations from center I | |
| 4 out of 5 points > 1 standard deviation from center li 15 points in a row within 1 standard deviation of center | ne (same side) 2 11 line (either side) 4 |
| 4 out of 5 points > 1 standard deviation from center I 15 points in a row within 1 standard deviation from center Iii 8 points in a row > 1 standard deviation from center Iii | ne (same side) 2 er line (either side) 4 ne (either side) 15 |
| 2 out of 5 points > 1 standard deviation from center 1 4 out of 5 points > 1 standard deviation from center line 15 points in a row within 1 standard deviation of center 8 points in a row > 1 standard deviation from center line | ne (same side) 2 er line (either side) 4 ne (either side) 15 Individuals-Moving Range Chart - Options |
| 4 out of 5 points > 2 standard deviations from center I 15 points in a row within 1 standard deviation of center 8 points in a row > 1 standard deviation from center Ii | ne (same side) 2 er line (either side) 4 ne (either side) 15 Ind ivid uals-Moving Range Chart - Options X Pauameters Estimate S Limits Tests Stages Box-Cox Display Storage |
| Help | ne (same side) 2 er line (either side) 4 ne (either side) 15 Individuals-Moving Range Chart - Options × Paxameters Estimate S Limits Tests Stages Box-Cox Display Storage Use a Box-Cox transformation (W = Y**Lambda) © Lambda = 0 (natual log) © Lambda = 0 (natual log) © Optimal lambda © Optimal lambda for each stage (in a chart with stages) © Other (enter a value between -5 and 5): |
| Help | ne (same side) 2 er line (either side) 4 ine (either side) 15 Tud ivid uals-Moving Range Chart - Options × Pavameters Estimate S Limits Tests Stages Box-Cox Display Storage Use a Box-Cox transformation (W = Y**Lambda) © Lambda = 0 (natural log) © Lambda = 0.5 (square root) © Optimal lambda for each stage (in a chart with stages) © Other (enter a value between -5 and 5): |
| A out of 5 points > 1 standaud deviations from center li 15 points in a row within 1 standard deviation of cente 8 points in a row > 1 standard deviation from center li Help QK | ne (same side) 2 er line (either side) 4 ine (either side) 15 Individuals-Moving Range Chart - Options × Pauameters Estimate S Limits Tests Stages Box-Cox Display Storage Use a Box-Cox transformation (W = Y**Lambda) © Lambda = 0 (natural log) © Lambda = 0.5 (square noct) © Optimal lambda for each stage (in a chart with stages) © Other (enter a value between -5 and 5): When the stage of the stage |

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| ndividuals-Moving Range Chart - Optio | ns X |
|---|---|
| Parameters Estimate S Limits Tests Sta | ages Box-Cox Display Storage |
| Subgroups to display | |
| Display all subgroups | |
| O Display last 25 subgioups | |
| Split chart into a series of segments for display ; | purposes |
| • Do not split | |
| C Each segment contains | subgioups |
| C Each segment comesponds to a stage (11 ch | art has stages) |
| Test results | |
| Display test results in Session window | ndividuals-Moving Range Chart - Options 🛛 🔀 |
| | Parameters Estimate S Limits Tests Stages Box-Cox Display Storage |
| | Store these estimates for each chart |
| Help | Means have to 14 the I |
| | ▼ Standaud deviations IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII |
| | 淮关幼礼笞州田 |
| | 上 华左的司异栉木 |
| | Store these values for each point |
| | Point plotted |
| | Center line value |
| | Control limit values |
| | T Stage |
| | |
| | |
| 雪林科林大學 幺纮可贵府安路 | |
| -云仰有双八子 尔列了非反员 飘 | Halp OK Capcel |



· 沒有點落在管制界限外。平均數33.5233,標
 準差0.426165



| Stat → Co Individua | ontrol Charts \rightarrow Control Charts for ls \rightarrow I-MR |
|--|---|
| Individuals-Moving Ran, C1 Period_setup C2 setup_x C7 Period_monitor C8 Monitor_x C9 MEAN1 C10 STDE1 | ge Chart × Variables: Monitor_x 指定製程監控資料的欄位 |
| | Scale Labels Multiple Graphs Data Options |
| Select Help | QK Cancel |

| | Individuals-Moving Range Chart - Options | × |
|--------|--|----|
| 輸入先前得到 | Parameters Estimate S Limits Tests Stages Box-Cox Display Storage | |
| 的製程平均數 | To specify the values for one or both parameters, enter them here. MINITAB uses these values instead of estimating them from the data. | |
| 和標準差 | Mean: 33.5233 | 1 |
| | Standaud deviation: 0.426165 | |
| | | ┛║ |
| | | |
| | | |
| | | |
| | Help <u>OK</u> Cancel | |

• 其他的設定維持不變







 有兩點落在管制界限外,製程可能發生變異, 需追查原因。



計數值修華特管制圖的種類

- 不合格率: P Chart; NP Chart
- 缺點數: C Chart; U Chart



繪製P Chart和NP Chart

- Stat → Control Charts → Attributes Charts → P...
- Stat → Control Charts → Attributes Charts → NP...
- 兩者畫面一樣

| | P Chart | |
|--------------|---|---|
| | Variables: | |
| ſ | 給予觀測值欄位,只 | |
| | 能有一欄 Subgroup sizes: | |
| | (enter a number or column containing the sizes) | L |
| | 每次抽樣的數量 Scale 管制圖的設定見下一頁 | |
| | <u>M</u> ultiple Graphs D <u>a</u> ta Options P Chart Options | |
| | Select | |
| 國 立 http: | Help <u>O</u> K Cancel | |

| P Chart - Options Pauameters Estimate S Limits Tests To specify a value for the proportion, ente estimating it from the dots Proportion: | Stages Display Stonage en it here. MINITAB uses this value instead of Chart - Options | X |
|--|--|---|
| 輸入已知的製 程不良率,若 未知則空白 Help | Parameters Estimate S Limits Tests Stages Display Storage Image: Ferform the following tests for special causes . Image: Imag |] |
| 國立雲林科技大學 系統可靠度實 http://campusweb.yuntech.edu.tw/~qra | Help <u>O</u> K Cancel | |

繪製P Chart 實例 (Ex. 4)

以Period 1~30數據設置 Period D Period D • Period D Period D P Chart,以Period 31~54 數據監控製程。 PS:每次抽樣數為50

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| <u>F</u> ile <u>E</u> dit | t D <u>a</u> ta <u>C</u> alc | <u>S</u> tat <u>G</u> raph | E <u>d</u> itor <u>T</u> (| ools <u>W</u> indov | w <u>H</u> elp | | | | | | | _ |
|---------------------------|------------------------------|----------------------------|----------------------------|---------------------|----------------|-----------|-------|---------|----|-------|-------|----------|
| |) 🐰 🖻 🛍 | ⊳ ⇔ 📴 | † . ‡ | A # 5 |) 🤋 🗊 🛛 🔁 🔂 | 1 🖻 🗟 🐮 | 1 C 🛛 | 1 💷 🛛 📉 | | ê 🖉 🍕 | 0 | |
| | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 |
| Peri | od_setup | D_setup | | | Period_Monitor | D_monitor | | | | | | |
| | 1 | 12 | | | 31 | 9 | | | | | | |
| | 2 | 15 | | | 32 | 6 | | | | | | |
| | 3 | 8 | | | 33 | 12 | | | | | | |
| | 4 | 10 | | | 34 | 5 | | | | | | |
| | 5 | 4 | | | 35 | 6 | | | | | | |
| | 6 | 7 | | | 36 | 4 | | | | | | |
| | 7 | 16 | | | 37 | 6 | | | | | | |
| | 8 | 9 | | | 38 | 3 | | | | | | |
| | 9 | 14 | | | 39 | 7 | | | | | | |
| | 10 | 10 | | | 40 | 6 | | | | | | |
| | 11 | 5 | | | 41 | 2 | | | | | | |
| | 12 | 6 | | | 42 | 4 | | | | | | |
| | 13 | 17 | | | 43 | 3 | | | | | | |
| | 14 | 12 | | | 44 | 6 | | | | | | |
| | 15 | 22 | | | 45 | 5 | | | | | | |
| | 16 | 8 | | | 46 | 4 | | | | | | |
| | 17 | 10 | | | 47 | 8 | | | | | | |
| | 18 | 5 | | | 48 | 5 | | | | | | |
| | 19 | 13 | | | 49 | 6 | | | | | | |
| | 20 | 11 | | | 50 | 7 | | | | | | |
| | 21 | 20 | | | 51 | 5 | | | | | | |
| | 22 | 18 | | | 52 | 6 | | | | | | |
| | 23 | 24 | | | 53 | 3 | | | | | | |
| | 24 | 15 | | | 54 | 5 | | | | | | |
| | 25 | 9 | | | | | | | | | | |
| | 26 | 12 | | | | | | | | | | |
| | 2.7 | 7 | | | | | | | | | | |
| | | | | | | | | | | | | |
| t Workshe | eet: Worksheet 3 | | | | | | | | | | | 12:38 AM |
| 始 🏉 | 🕑 🙆 🌔 | 🔌 🍪 💆 🜌 | 🖸 🏹 i | 2 🚷 | | | | | | I 🖮 2 | - "8! | 🛃 🕹 上午 1 |

• Stat → Control Charts → Attributes Charts → P...

| P Char | t | | | × | |
|------------------------------|--|-----------------------------|-----------------------|-----------------|-----|
| C1 1 C2 1 C5 1 C6 1 | Period_setup D_setup Period_Monitor D_monitor | Variables: 'D_setup' | 指定設置 缺點數 | 管制界限的 資料欄位 | |
| | | S <u>u</u> bgroup sizes: 50 | | | |
| | | (enter a number or column | containing the sizes) | 每次抽50 | 個樣本 |
| | | <u>S</u> cale | Labels | | |
| | | <u>M</u> ultiple Graphs | D <u>a</u> ta Options | P Chart Options | |
| | Select | | | | |
| | Help | | QK | Cancel | |
| | | | | | |
| 國立雲 http://co | 林科技大學 系統可靠 mpusweb vuntech edu | 靠度實驗室 tw/~gre/index.htm | | | |

| P Chart - Options |
|---|
| Pavameter Estimate S Limits Tests Stages Display Storage 不良率未知, |
| To specify a value for the proportion, enter it here. MINITAB uses this value instead of 所以不用填寫 |
| Propertion: |
| P Chart - Options |
| Parameters Estimate S Limits Tests Stages Display Storage |
| Omit the following subguoups when estimating parameters (eg. 3 12:15) |
| P Chart - Ontions |
| Pavameters Estimate S Limits Tests Stages Display Storage |
| Perform the following tests for special causes |
| ✓ 1 point > 3 standard deviations from center line |
| 9 points in a row on same side of center line |
| 6 points in a row, all increasing or all decreasing |
| 14 points in a row, alternating up and down |
| |
| |
| |
| |
| |
| 國立雲林科技/ http://campusweb |

| Chart - Options |
|---|
| Chart - Options Pauameters Estimate S Limits Tests Stages Display Stages Display Stages Display Stages Display Stages Display Stages Display Stages Stages Display Stages Stages < |
| ✓ Display test uesults in Session window P Chart - Options × Help OK Parameters Estimate S Limits Tests Stages Display Storage Help OK V Proportions 將不良率的計算 結果記錄下來 |
| Store these values for each point Point plotted Subgroup size Center line value Test results Control limit values Stage |
| 型立雲林科技大學系統可靠度實驗室 ttp://campusweb.yuntech.edu.tw/~qre/index.htm |



 有兩個點落在管制界限外,追查原因後,發現是管 制圖誤判,所以保留兩筆數據。

P = 0.231333

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屋 ht Stat → Control Charts → Attributes Charts → P...

| P Chart | | | × | |
|--|--|------------------------|-----------------|------|
| C1 Period_setup C2 D_setup C5 Period_Monitor C6 D_monitor | Variables: 'D_monitor' | 指定製 | 程監控資料 點數欄位 | 的 |
| | Subgroup sizes: 50 | | | |
| | (enter a number or column c | ontaining the sizes) | 每次抽5 | 0個樣本 |
| | <u>S</u> cale <u>M</u> ultiple Graphs | Labels Data Options | P Chart Options | |
| Select | | | | |
| Help | | Ōĸ | Cancel | |
| 立雲林科技大學 系統可靠」 tp://campusweb.yuntech.edu.tw/ | 变實驗室 ~qre/index.htm | | | |



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有一個點落在管制界限外,表示製程發生異常,需追查原因。



繪製NP Chart 實例 (Ex. 5)

- ・以Ex. 4數據繪製NP Chart。
- Stat → Control Charts → Attributes Charts → NP...
- 作法和設定方法如同P Chart



繪製C Chart 實例 (Ex. 6)

• 以Period 1~25數據設置 C Chart,以Period 26~46 數據監控製程。

PS:每次抽樣數為100

| period | С | period | С | D 1 | a | D · 1 | ~ |
|--------|----|----------|-----|--------|----|--------|-----|
| 1 | 21 | 14 | 19 | Period | C | Period | C |
| 2 | ~ | 15 | 10 | 27 | 16 | 37 | 18 |
| 2 | 24 | 15 | 10 | 28 | 18 | 38 | 21 |
| 3 | 16 | 16 | 17 | 20 | 12 | 20 | 16 |
| 4 | 12 | 17 | 13 | 29 | 12 | 39 | 10 |
| 5 | 15 | 18 | 22 | 30 | 15 | 40 | 22 |
| 5 | - | 10 | 22 | 31 | 24 | 41 | 19 |
| 6 | 5 | 19 | 18 | 32 | 21 | 42 | 12 |
| 7 | 28 | 20 | 39 | 22 | 20 | 12 | 1.4 |
| 8 | 20 | 21 | 30 | 33 | 28 | 43 | 14 |
| 0 | 20 | 21 | 24 | 34 | 20 | 44 | 9 |
| 9 | 31 | 22 | 24 | 35 | 25 | 45 | 16 |
| 10 | 25 | 23 | 16 | 26 | 10 | 16 | 21 |
| 11 | 20 | 24 | 19 | 30 | 19 | 40 | 21 |
| 12 | 24 | 25 | 17 | | N | | 1 |
| | - | _ | ± / | | | | 1 |

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|-----------|--------------|------------|--------------|---------|--------|---------------|-----------|----|-----------|------|-----|
| C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 | C10 | C11 | C12 |
| iod_setup | D_setup | | | | | period_Monior | D_monitor | | | | |
| 1 | 21 | | | | | 27 | 16 | | | | |
| 2 | 24 | | | | | 28 | 18 | | | | |
| 3 | 16 | | | | | 29 | 12 | | | | |
| 4 | 12 | | | | | 30 | 15 | | | | |
| 5 | 15 | | | | | 31 | 24 | | | | |
| 6 | 5 | | | | | 32 | 21 | | | | |
| 7 | 28 | | | | | 33 | 28 | | | | |
| 8 | 20 | | | | | 34 | 20 | | | | |
| 9 | 31 | | | | | 35 | 25 | | | | |
| 10 | 25 | | | | | 36 | 19 | | | | |
| 11 | 20 | | | | | 37 | 18 | | | | |
| 12 | 24 | | | | | 38 | 21 | | | | |
| 13 | 16 | | | | | 39 | 16 | | | | |
| 14 | 19 | | | | | 40 | 22 | | | | |
| 15 | 10 | | | | | 41 | 19 | | | | |
| 16 | 17 | | | | | 42 | 12 | | | | |
| 17 | 13 | | | | | 43 | 14 | | | | |
| 18 | 22 | | | | | 44 | 9 | | | | |
| 19 | 18 | | | | | 45 | 16 | | | | |
| 20 | 39 | | | | | 46 | 21 | | | | |
| 21 | 30 | | | | | | | | | | |
| 22 | 24 | | | | | | | | | | |
| 23 | 16 | | | | | | | | | | |
| 24 | 19 | | | | | | | | | | |
| 25 | 17 | | | | | | | | | | |
| 26 | 15 | | | | | | | | | | |

nt Worksheet: Worksheet 4

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• Stat → Control Charts → Attributes Charts → C...

| C Chart | | | × | |
|---|--|------------------------|--------------------------|--|
| C1 period_setup C2 D_setup C7 period_Monior C8 D_monitor | Variables: | 指定設置管 缺點數章 | 會制界限的 資料欄位 | |
| | | | | |
| | <u>S</u> cale <u>M</u> ultiple Graphs | Labels Data Options | C Chart Options | |
| Select | | | | |
| Help | 非人义 只 "纵 工 | Ōĸ | Cancel | |
| http://campusweb.yuntech.edu | tw/~qre/index.htm | | | |

| C Chart - Options | |
|--|------|
| Parameters Estimate S Limits Tests Stages Display Storage 平均數 | 未知, |
| To specify a value for the mean, enter it here. MINITAB uses this value instead of estimating 所以不 | 用埴宜 |
| Mean: | うる大学 |
| | |
| Parameters Estimate S Limits Tests Stages Display Strage | |
| Omit the following subgroups when estimating parameters (eg. 3 12:15) | |
| | |
| C Chart - Options | |
| Parameters Estimate S Limits Tests Stages Display Storage | |
| Perform the following tests for special causes | |
| ✓ 1 point > 3 standard deviations from center line ✓ 9 points in a row on same side of center line | |
| 6 points in a now, all increasing or all decreasing | |
| 14 points in a yow, alternating up and down | |
| | |
| | |
| | |
| 國立 9 | |
| http://cHelpOKCancel | |

| 'anametens Estimate S Limits Tests Stag Subgnoups to display | res Display Stonage |
|---|--|
| ⑦ Display all subgroups ⑦ Display last | |
| Split chaut into a series of segments for display pu Do not split Each segment contains Each segment corresponds to a stage (11 char | nposes subgroups At has stages) |
| Test results Display test results in Session window | C Chart - Options |
| Help | ▶ № № № № № № № № № № № № № № № № № № № |
| | Store these values for each point |
| | Point plotted Center line value Control limit values |
| | 1 100ge |
| L雲林科技大學系統可靠度實驗室 | HelpQKCancel 💋 |



有兩個點落在管制界限外,追查原因後,發現
 是管制圖誤判,所以保留兩筆數據。

 $\overline{C} = 19.8462$



Stat → Control Charts → Attributes Charts → C...

| C Chart | | × | |
|---|---------------------------|------------------------------|--|
| C1 period_setup C2 D_setup C7 period_Monior C8 D_monitor | Variables: 'D_monitor' | 占定型程些控資料的 | |
| | | 胡人 教 在 盖 社 員 不 的 | |
| | Scale | Labels | |
| Select | <u>M</u> ultiple Graphs | Data Options C Chart Options | |
| Help | | QK Cancel | |
| 工雪林科技大學 系統可靠 | 注度實驗 室 | | |

| C Chart - Op | ptions 2 | |
|--------------------------------|--|-----------|
| Parameters) | Estimate S Limits Tests Stages Display Storage | |
| To specify a it from the da | value for the mean, enter it here. MINITAB uses this value instead of estimating | |
| <u>M</u> ean: | 19.8462 | |
| 輸 <i>入</i> 數, | 、先前得到的平均 ,其他的設定不變 | |
| Help | <u>O</u> K Cancel | |
| | | |





• 沒有點落在管制界限外,表示製程正常



繪製U Chart 實例 (Ex. 7)

• 以Period 1~10數據設置 U Chart,以Period 11~20 數據監控製程。 Period_setup C_setup Period_Monitor C_Monitor PS:每次抽樣數為5 國立雲林科技大學 系統可靠度實驗室 http://campusweb.yuntech.edu.tw/~qre/index.htm

<u>File E</u>dit D<u>a</u>ta <u>C</u>alc <u>S</u>tat <u>G</u>raph E<u>d</u>itor <u>T</u>ools <u>W</u>indow <u>H</u>elp 🖶 😂 ¼ ๒ 🛍 ∽ ∽ 🖪 ↑ ↓ ₦ ₭ 🛇 १ 🕬 🕂 🖶 ि 🕢 ව 🗟 🕯 ዃ 🗉 🖽 🐼 🚽 🖉 C6 C7 C1 C2 C3 C4 C5 C8 C9 C10 C11 C12 Period_setup C_setup Period_Monitor C_Monitor б б it Worksheet: Worksheet 5 1:39 AM

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| Stat → C | ontrol Charts -> Attributes Charts -> U |
|--|--|
| J Chart C1 Period_setup C2 C_setup C6 Period_Monitor C7 C_Monitor | Variables: 指定製程監控資料的 'C_setup' 缺點數欄位 |
| | Subgroup sizes: 5 (enter a number or column containing the sizes) 每次抽5個樣本 Scale |
| Select | Multiple Graphs Data Options |
| 立雲林科技大學 系統 p://campusweb.yuntech.ec | 可靠度實驗室 hu.tw/~qre/index.htm |
| | |
| hart - Options warmeters Estimate S Limits corpority or more for the mesor, of thorn the data. <u>J</u> ean: U Chart - Options Parameters Estimate s | Tests Stages Display Storage Atrikles MENITAE |
| hart - Options warmeters Estimate S Limits So specify a value for the mean, of throm the data. Mean: U Chart - Options Parameters Estimate Omit the following subg | Tests Stages Display Stowage WENTTAB were this value instead of estimating WENTTAB were this value instead of estimating WENTTAB were this value instead of estimating Playmeters Stages Display Stowage Chart - Options Pavameters Estimate S Limits Tests Stages Display Stowage |
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| Chart - Options axameters Estimate S Limits To posify a value for the mean, of t from the data. Mean: U Chart - Options Parameters Estimate Omt the following subge Help Help | Tests Stages Display Stange Arithmer MINITAB core kis volue included of estimating Arithmer MINITAB core kis volue included of estimating S Limits Tests Stages Display Stoage Supre when estimating parameters (eg. 3 12:15) Chart - Options Faameters Estimate S Limits Test Stages Display Stoage Fadoren the following tests for special causes P opints in a zow, all increasing on all decreasing 1 4 points in a zow, allemating up and down Help OK Cancel |

| exameters Estimate S Limits Tests Sta Subgroups to display Display all subgroups Display last Split chart into a series of segments for display p Do not split Each segment contains Each segment contains C Bach segment contains | ges Display Stowage | |
|--|---|---|
| Test results Display <u>t</u> est results in Session window Help | U Chart - Options Pavameters Estimate S Limits Tests Store these estimates for each chart | × s Stages Display Storage 將平均數的計算 結果記錄下來 □ Subgroup size □ Iest results |
| .雲林科技大學 系統可靠度實驗室 //campusweb.vuntech.edu.tw/~are/index. | Help | OK Cancel |



沒有點落在管制界限外

$$\overline{U} = 2.26$$



Stat → Control Charts → Attributes Charts → U...

| U Chart C1 Period_setup C2 C_setup C6 Period_Monitor | Variables: 'C_Monitor' |
|---|--|
| | Subgroup sizes: 5 Genter a number or column containing the sizes 缺點數欄位 |
| | Scale Labels Multiple Graphs Data Options |
| Select Help | <u>OK</u> Cancel |
| 立雲林科技大學 系統可靠度] tp://campusweb.yuntech.edu.tw/~qi | F驗室 re/index.htm |

| U Chart - C | ptions | | | | | | | × | |
|---------------------------|-------------------------|--------------|--------------|----------|---------------|--------------|------------------|---|--|
| Parameters | Estimate | S Limits | Tests | Stages | Display | Storage | 1 | | |
| To specify it from the | a value for ti data. | he mean, ent | ter it here. | MINITAI | B uses this v | value instea | ad of estimating | | |
| <u>M</u> ean: | [| 2.26 | | | | | | | |
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| | 段,_ | 其他 | 的彭 | 定定 | 不變 | | | | |
| Help | , | | | (| <u>o</u> k | | Cancel | | |







• 沒有點落在管制界限外,表示製程正常



系統可靠度實驗室 國立雲林科技大學工業工程與管理所



The End Thank you

http://campusweb.yuntech.edu.tw/~qre/index.htm