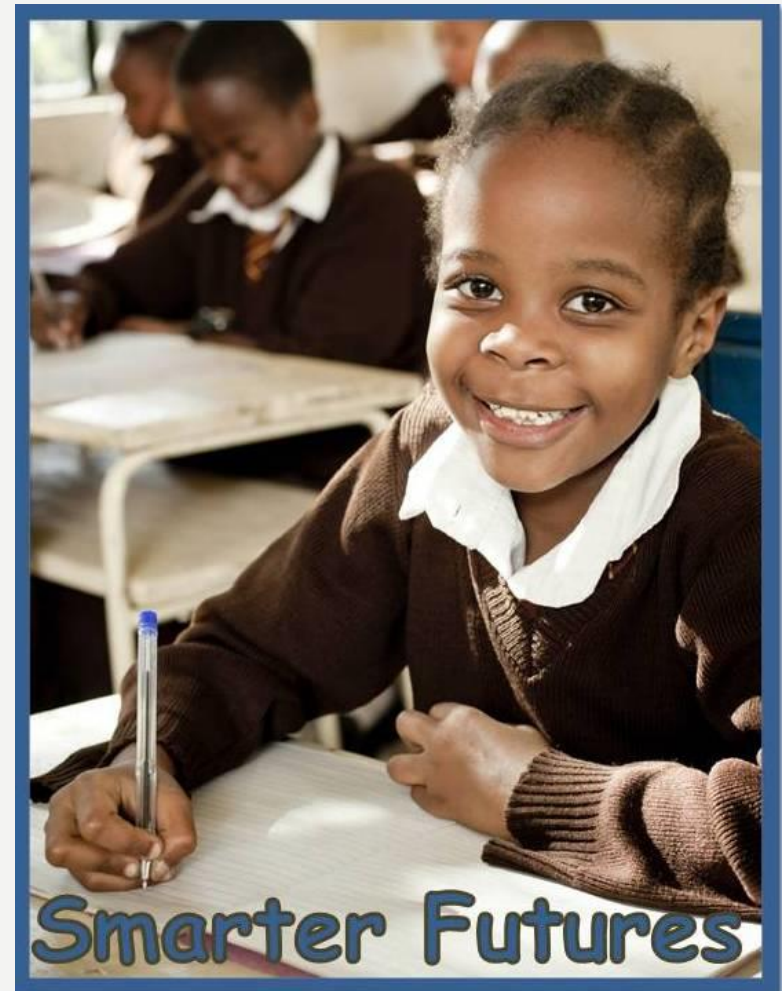


MILLING INDUSTRY QUALITY ASSURANCE PRINCIPLES AND PRACTICES

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[WWW.DIFFEN.COM/DIFFERENCE/QUALITY ASSURANCE VS QUALITY CONTROL](http://WWW.DIFFEN.COM/DIFFERENCE/QUALITY_ASSURANCE_VS_QUALITY_CONTROL)

- **Quality Assurance** is process orientated and focuses on defect prevention
- **Quality control** is product orientated and focuses on defect identification

BASIC PRINCIPLES

- Get the raw material (s) right
- Look after the critical parts of the process
- The finished product look after itself

**IF IT CAN NOT BE
MEASURED IT
CAN NOT BE
CONTROLLED**

MONITORING

- As any form of monitoring costs money – the principles of HACCP must be applied.
- Ask yourself the following reasonable questions and ensure you get reasonable answers.

QUESTIONS

- What can be measured ?
 - What can be controlled ?
- What needs to be measured ?
 - How should it be measured ?
- Who is going to do the measuring ?
 - What am I going to do with the results obtained ?
- How much will it cost to do the above ?
 - Is the cost/benefit equation favourable ?

WHAT ARE WE LOOKING FOR?

- Compliance – often within unrealistic limits – of the micronutrient content of a fortified food vehicle

OBJECTIVES

- Provide information on what needs to be done to ensure that regulatory and consumer requirements are met.
- Improve knowledge regarding record-keeping and monitoring procedures that have to be instituted to be compliant with the quality assurance scheme.
- Improve understanding of different elements of the inspection procedure to be followed.

IMPORTANT

- Promote corporate responsibility and governance.
- Encourage ownership of fortification with mill staff (fortification might be built top down but it is implemented bottom up).

MAIN ELEMENTS - FORTIFICATION

- Equipment – suitable, accessible and usable
- Quality premix
- Properly stored premix
- CoA
- FIFO
- Re-test By Date
- HACCP
- Micro-feeder control
- Rapid tests/checks
- Keep records of raw material procurement; fortification mix inventory and usage; production; premix use.
- These records should correspond with the monthly production records;



MICRO-FEEDER QUESTIONS

HOW ACCURATE IS THE MICRO FEEDER?

- Feeder accuracy, in itself, is not a single determinant.
- It is a function of repeatability, linearity and stability.
 - **Repeatability** is consistency of feed at a given setting;
 - **Linearity** is how accurately the feeder discharges across the operating range and
 - **Stability** is performance drift over time.

REPEATABILITY

- Commonly termed precision this factor is the most familiar to users and is a measure of the short term consistency of the discharge rate.
- It is important to QA because it measures the variability of the discharge feed and hence of the final product.
- Note this does not include the variation in the flow rate of the mill product i.e. the flour.

- A definition of repeatability should include both the variability and the method used to determine that variability assessment i.e. $\pm 0.5\%$ of average @ 2 sigma based on 20 samples of 1 minute.
- Repeatability measures only the variability of the discharge – it does not provide information about whether the feeder is delivering, on average, the targeted rate.

LINEARITY

- To perform linearity several groups of samples need to be taken across the stated operating range, and these values then averaged to produce a single value. Again average values and deviations are calculated. A linearity statement would, therefore, look something like $\pm 0.2\%$ based on 5 samples of 1 minute over a range of 5% to 100%
- Range will typically be 10 to 80% but millers should be wary of using a feeder that is operating so close to the limits of its capability.

STABILITY

- This is perhaps the most important criteria, and the one most overlooked. Many factors contribute to drift – some are the characteristics of the fortification mix the rest are feeder related.
- Drift is checked by calibration checks – the more often and severe the drift the more checks, and adjustments, are required.
- This is a hidden on-going cost to the miller and out of specification product (which carries its own economic consequences).



**QA FOR
FORTIFICATION
IS OFTEN
FOCUSSED IN
OTHER AREAS**

TRACEABILITY AND FORTIFICATION

- With fortification we NEED traceability
- Traceability was originally required in case a safety issue was raised i.e. contamination, so a product could be 'easily' recalled
- Traceability identification also protects us against fraud and counterfeiting

TRACEABILITY – HOW AND TO WHAT?

- Tracing back to date of manufacture may not be realistic as we could, theoretically, have multiple days production in a single bin
- We can trace back to date of packing data and from there to our 'finished product inspection' and then get some idea of what was happening in process control (especially if we log what went into which bin on what day)

TRACEABILITY AND FORTIFICATION

- To comply we often add an overage
- If we do not have traceability:
- How are we going to monitor our production protocols to see if the overage is adequate or if we can reduce it slightly? [**Financial implication**]
- How are we going to demonstrate we did actually fortify that non-compliant sample? [**Reputation**]

SAMPLING AND FORTIFICATION

- Sensitive issue – especially in the area of international trade.
- Cannot treat imports stricter than local production (need to discuss implications with local WTO contact point)

SAMPLING

- Fortified products are heterogeneous for micronutrients compared to being homogeneous for moisture
- Mill staff are taking samples every hour in large mills.
- Mills composite these hourly samples to ensure their own sample is representative
- Regulator can take from this composite

PRECAUTION

- Keep a few packs of each batch in the warehouse under your recommended storage conditions
- Ensure traceability and you can now contest non-compliance in the market samples

MILLING AND FORTIFICATION

- Addition rates of, for example, 200g/MT require we actually know how much flour is being produced per unit time.
- Variability in flour mills (per unit time) can be significant as extraction varies according to mill set up (easy to control) and the wheat to 1st Break itself (not so easy to control)

INFLUENCING FACTORS

- The grist itself:
 - Be it a single wheat type or a blend of types
 - How consistent is the wheat within each type in terms of morphology, test weight and moisture
 - Conditioning (tempering) conditions (time and water addition)

- Conditioning is often highly automated – just because a machine tells you its OK doesn't mean it is. Check the machine (careful of grain surface moisture)
- Millers **frequently** go round checking and adjusting mill settings when it is the wheat that needs adjusting



**QUANTIFY YOUR
WEAK POINTS**

WHAT ARE WE MEASURING?


- The TOTAL micronutrient content of the food vehicle which:
 - May or may not already have an intrinsic micronutrient content
 - If it has an intrinsic content it is both unknown (potentially unknowable) and is
 - Highly variable due to environmental factors (totally uncontrollable) plus
 - Processing variability (impossible to predict).

LABORATORY VARIATION

- In two trials (43 and 38 samples) in which the laboratory performed, and reported, duplicate analysis the calculated CV was 6.0 and 6.4%
- In one of the trials (12 samples) the same laboratory performed duplicate analysis without being aware of it (blind duplicates) the calculated CV was 26.2%

CONTROL CHARTS

- Possibly the most important tool in a laboratory or production facility and the least used



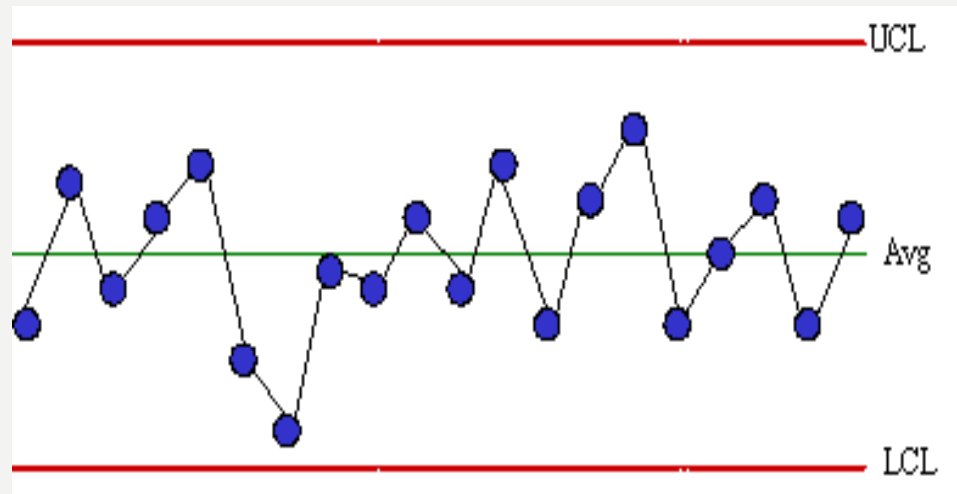
**THE MAIN PURPOSE OF
USING A
CONTROL CHART IS TO
MONITOR, CONTROL, AND
IMPROVE PROCESS
PERFORMANCE OVER
TIME BY STUDYING
VARIATION
AND ITS SOURCE.**

THERE ARE SEVERAL FUNCTIONS OF A CONTROL CHART:

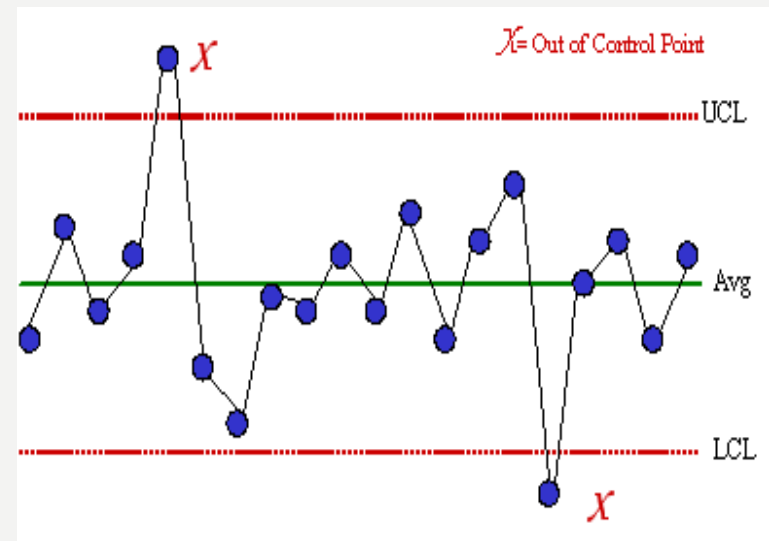
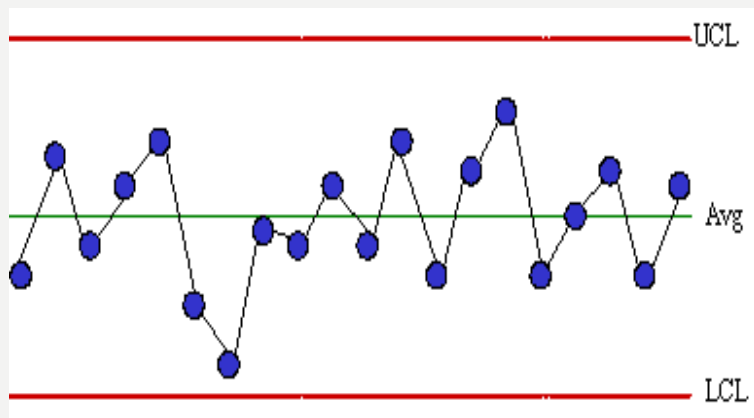
- It centres attention on detecting and monitoring process variation over time
- It provides a tool for ongoing control of a process
- It differentiates special from common causes of variation in order to be a guide for local or management action
- It helps improve a process to perform consistently and predictably to achieve higher quality, lower cost, and higher effective capacity
- It serves as a common language for discussing process performance

THREE CHARACTERISTICS OF A PROCESS THAT IS IN CONTROL:

- Most points are near the average
- A few points are near the control limits
- No points are beyond the control limits

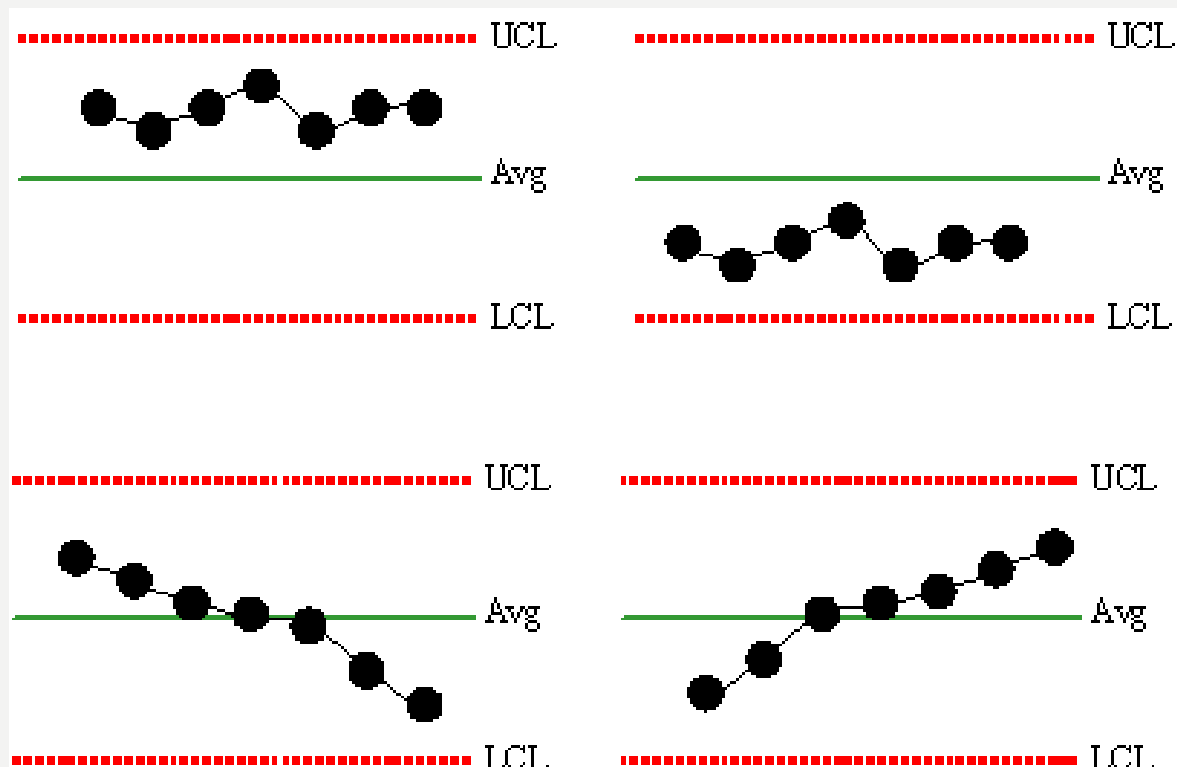


COMPARISON



RULE OF 'SEVEN' - STATES THAT AN OUT OF CONTROL SITUATION IS PRESENT IF ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- 'Seven' points in a row above or below the average
- 'Seven' points in a row trending up or down





EXTREMELY SHORT VARIABILITY

**A 10 MT/HOUR WHEAT TO 1ST
BREAK**

**AND A 75% EXTRACTION
PRODUCES**

CIRCA 2,100 G PER SECOND

**A TYPICAL SAMPLE TO THE
LABORATORY IS 250 G**



