

# TIPS ON BATCH SIZE SELECTION

To arrive at a sensible batch or lot size for mixer selection and sizing, a number of planning considerations must be addressed in addition to various typical in-plant constraints. The type of mixer chosen may also have an impact on batch sizes.

## ANNUAL AND DAILY OUTPUT PLANNING

Before we consider a list of the planning and constraint factors or points of consideration, let us address the most basic planning approaches for useful batch size determinations. Start with an annual output expectation and assume that you will have an effective 11 month production year due to the inevitable summer holiday disruptions and in some cases protracted holiday seasons. April is a difficult month for business in South Africa with a high number of public holidays leading to a reduced manufacturing activity. Taking this analysis further, you may have a very strong seasonal demand for your product and thus you may need to set your monthly output planning at the average output needed in high seasonal months.

Once the required monthly capacity plan has been determined, decide if you will operate with one or more shifts and the number of days to use for planning purposes in any one month. Allow for some downtime for unplanned disruptions such as power outages that may lead to planning for a 20 day month on one or two shifts.

Finally consider future batch size expectations and if the mixer should be sized for anticipated rapid growth. Alternately consider batch size by use of a future second or more mixers to cope with rapid growth.

## TYPICAL BATCH RESIDENCE TIME

At this point you will need some sense of typical batch mixing times or residence times in the mixer as required by the process. You may have some batch cycle times from laboratory or other pilot work, or experience of other industry players. Some authors stress the need to carefully interpret cycle times from laboratory studies as the actual test runs may have been run too 'thoroughly' or simply run at great length for no useful purpose. We concur with the need to consider such information with due care.

Should you not have any test data and any sense of likely batch times, you should discuss your problem with E4A so that we can assess together a guideline batch size for further planning and sizing purposes. But first we must consider a number of other factors that impact on your batch size and total cycle production times.

## PLANNING AND IN-PLANT CONSTRAINTS

The following factors must be considered when doing the batch size planning:

1. How are the raw materials to be supplied and loaded into the mixer?
2. Is a high degree of supply line automation required to sensibly load up the mixer?  
Protracted filling time and/or protracted discharge time can totally dominate the total cycle time.
3. Is the mixer to be placed on load cells that will automatically cut off feed supply when certain load settings have been reached?
4. Is a high degree of discharge automation required to sensibly unload the mixer?  
Protracted discharge time can also totally dominate the total cycle time.
5. What are the needs for special colours, special additives or special recipes in each batch? What are the implications for smaller or larger batch sizes given these colour

or other needs. Can the mixer cope with your batch size variation? The impeller may not be adequately immersed or covered by the product and this could significantly affect the mixing performance. You should discuss your planned batch size range for the selected mixer with specialist supplier companies.

6. What are the packing needs and can these be done in a separate location to enable ongoing mixing in the mixer itself? Coating plants are frequently set as a two to three pot layout with one main mixer that swivels between the pots, enabling mixing and filling to be separately executed.

A wide range of other factors from hygienic design to explosion risks will of course often apply and a full analysis of practical possibilities will need to be considered. We will not endeavour to cover every factor here.

It is worth mentioning that handling of bulk feed or finished product needs much consideration as smaller plants and start up plants lack a forklift and this can lead to major constraints on handling of materials to and from the tank.

### **FINAL BATCH SIZE SELECTION**

Once the likely workable and practical batch size is determined, a final check should be made on the targeted daily output. This may necessitate the installation of more than one mixer in parallel or a re-think of the feed and discharge planning. The classical trade off of between capital costs and manpower costs may of course also necessitate re-planning.

At this point the batch size decision should be shared with specialist suppliers so that they can confirm optimum machine design. The final batch size is the key parameter of the overall mixing objective for the total plant, but should be balanced with decisions on capital-manpower and most importantly power costs.

Future expansion or increased use of the initial planned capacity can be best achieved by good layout planning at the early stages, especially where factory building space enables such considerations. Additional mixing pots, extra mixers in parallel and more automation of feed and discharge lines can be done provided the forward planning has been done. We have given excellent advice and made major cost savings for clients by such upfront consultation and we offer our services for the wider project management that is so important in this respect. Please contact us at an early stage of your planning should you wish to engage our services.

*These guidelines and notes are presented as general guides only and no warranty is implied or provided.*