

# Testing and Validation of Two Wheeler Assembly Line Slat Conveyor

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**Abstract** - In this paper testing and validation part of 2 wheeler assembly line slat conveyor is suggested for the company who is in the process of atomization of plant. Company need dedicated conveyor system for 8 station 2 wheeler assembly line. Methodology of testing and validation for slat conveyor is explained in this paper to define satisfactory performance of developed conveyor. With the proposed conveyor System labor cost will be reduced also transportation of material handling cost will be reduced. On this conveyor system vehicle move from first station to last station and assembly operations are performed simultaneously with the help of control panel.

**Key Words:** Slat conveyor, testing, validation, speed testing, load testing, current rating,

## 1. INTRODUCTION

A conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy or bulky materials. Conveyor are mainly consisting of one or more endless chain on which slat, roller or belt are attached to form moving support of object being conveyed. They are driven by motor or gravitation energy. Many kind of conveying system are available and used according to various needs of different industries. Chain conveyor, roller conveyor, slat conveyor, gravity conveyor, belt conveyor, overhead conveyors commonly used in many industries including mining, automotive, agriculture, computer, processing, food, electronic, aerospace etc. for various purpose and application.

Slat conveyor is a conveyor consisting of one or more endless chain to which horizontal slats are attached to form a moving support for object being conveyed. Slat conveyor is suitable for vehicle assembly line. They consists of slats attached on endless chain drive shaft assembly consist of sprocket, transmission shaft which is driven by the motor and give required power to the chain and drive the conveyor. Take up assembly at another side consist of component sprocket and take up shaft provide required tension to the chain.

In this paper testing part of that conveyor is explained. Assembly level inspection, idle load testing, speed testing and load testing is explained in this paper. There are some company standards to define satisfactory performance of conveyor. If conveyor shows the expected result and satisfies

the requirement of customer in overall testing then it is define as satisfactory performance.

## 2. METHODOLOGY OF TESTING AND VALIDATION

According to company standard testing of slat conveyor is carried out in 3 steps,

1. Assembly level testing
2. Idle testing
3. Load testing

In assembly level testing dimensional inspection is very important part. In which dimensions of all part are checked as per drawings and certified if they are in within acceptable limit. Removal of sharp edges/corners is also checked. After completion of overall assembly check use of correct hardware i.e. nut, bolt etc.

Idle speed testing is carried out mostly to check speed of conveyor and current ratings of motors in testing period. When assembly is completed temporary control panel connected to the conveyor and motor is started to take trial for initial testing with very low speed. If it work proper then control panel is connect to the conveyor and drive conveyor for decided time. In this testing period check the speed of the conveyor, current ratings, smooth working, any noise or vibration etc.

Load testing of conveyor is carried out after successful speed testing. If conveyor gives required speed without any failure, noise and vibration with smooth motion of chain then take a load test. In load testing working or dead weight is placed on conveyor and conveyor move for some time. In that period observe deflection in chain, tension in chain, deflection in slat, noise and vibration, current rating, smooth working of conveyor.

### 2.1 Assembly level testing:

At assembly level testing very basic observations are taken such as dimension of component as per drawing. In this testing use of hardware, fabrication structures, lubrication system is also tasted.

- Conveyor system consists of mechanical component and structure member. Mostly all the parts are outsource from vendors. An acceptance criterion of each component is mention on the drawing. Check all the parts with respect to the acceptance criteria and check dimensions within acceptable limit.

- After completion of entire assembly of conveyor system check use of correct hardware i.e. nuts, bolts, fixing of circlips and leveling pads. Check fettling of welding residuals.
- Check level of lubrication oil in gear box and leakage of oil.
- Check use of electrical cables is appropriate, ear thing connection, Limit / proximity switch fitting.  
If any error occurs in this testing replace that part or do the correct action.

### 2.2 Idle testing

Slat conveyor is design to work at required speed and load. Idle speed testing is carried out mostly to check speed of conveyor and current ratings of motors in testing period. Speed of conveyor and current rating of motor is check at various working condition and frequency. Frequency is set by using VFD connect on control panel.

- When assembly is completed control panel is connected the conveyor set frequency on 48 Hz observe current drawn by motor and speed of conveyor.
- Conveyor is move for 5hrs and following observation are taken,

Table no. 1 shows the observation of Idle tasting.

48 Hz frequency set on control panel by VFD.					
SR.	Condition	Current in A	Time to move for 1m in sec.	Speed of conveyor in mpm	Time req. to complete 1 revolution of conveyor
1.	Only motor with gear box	1.2	-	-	-
2.	Motor and gear box connected with drive shaft of conveyor	1.45	12	5	6
3.	After 1hr	1.5	12	5	6
4.	After 2hr	1.52	12	5	6
5.	After 3hr	1.52	12	5	6
6.	After 4hr	1.55	12	5	6
7.	After 5hr	1.6	12	5	6

Time to move for 1m = 12 sec

$$\begin{aligned} \text{Speed of conveyor in mpm} &= \frac{60}{\text{Time to move for 1m}} \\ &= 60/12 \\ &= 5 \text{ mpm} \end{aligned}$$

∴ Revolutions complete in 5hrs. =

$$\begin{aligned} &\frac{\text{Total working time.}}{\text{Time required for conveyor to complete 1rev}} \\ &= \frac{300}{6} \\ &= 50 \text{ rev.} \end{aligned}$$

Conveyor completed 50 revolutions in 5hrs with speed 5mpm at frequency 50 Hz. According to design parameters rated current value is 2.5 A. Average current value observes during 5hrs testing period is 1.5 A. Current ratings are less than the rated current value so motor work with design limit.

### 2.3 Load testing

Load testing of conveyor is carried out after successful speed testing. If conveyor give required speed without any failure, noise and vibration with smooth motion of chain load testing is carried out.

1. In load testing working or dead weight equal to working load is placed on conveyor and conveyor move for some time. In that period deflection in slat, noise and vibration, current rating, speed and smooth working of conveyor is tasted.
2. For this project load testing is carried out by using dead weight. 3 dead weight 500kg each are placed on the conveyor increase the weight on the conveyor in 3 stages from 500 kg to 1500kg. Total dead weight is 1500kg equivalent to the working load.
3. Conveyor gives required speed at 48 Hz set same frequency on control panel and increase load simultaneously from 500kg to 1500kg and observe current drawn by motor and speed of conveyor at each stage.

Table no. 2 shows the observation of load tasting.

48 hz frequency set on control panel by VFD.					
SR.	Condition	Current in Amp	Time to move for 1min sec.	Speed of convey or in mpm	Time req. to complete 1 revolution of conveyor
1.	Conveyor without load	1.5	12	5	6
2.	<b>Conveyor with load</b>				
2.1	With load 500kg	1.7	12	5	6
2.2	With load 1000kg	1.86	12	5	6
2.3	With load 1500kg	2.1	12	5	6

- From the observations we can see that speed of conveyor remains same at loading condition i.e. 5mpm.
- Current drawn by the motor is simultaneously increased from 1.7 to 2.1 Amp. Maximum value of current is 2.1 Amp at maximum loading condition. These values are within the design limit so motor work within design limit.

### 3. EXPERIMENTAL RESULT

- As shown in Table no.1, in 5 hrs speed trial testing maximum current rating is 1.6 A without any load. Maximum current carrying limit for 0.75 kW motor is 2.5 A installed for the trial. This shows that current rating is well within the limit. Observe speed of the conveyor is 12 sec. per meter and 5 meter per min. required speed of the conveyor is 5 mpm. So it is say that conveyor work at required speed.
- As shown in table no.2 as load increase from 500 kg to 1500 kg conveyor current rating also increase from 1.7 A to 2.1 A. maximum current rating is 2.1 A at maximum loading condition. These values are well within the limit. In the load testing speed of conveyor also observe. Observe speed of conveyor remains same at loading condition i.e. 5mpm.
- When load is put on conveyor current rating is increased from 1.5amp to 2amp but it is within the rated current value.

### 4. Conclusion:

On the basis of experimental result we can conclude,

1. Conveyor system gives required speed with selected motor within rated current value. So working of conveyor at speed 5 mpm is safe.
2. Conveyor also safely works at maximum loading condition with same speed and within rated current value without any failure. .
3. In overall testing conveyor shows accepted result and give satisfactory performance so it is say that this designed and developed conveyor satisfy all requirement of customer who needed slat conveyor for 8 station two wheeler assembly line.

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